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NEWSPAPER

DP and the Public

Cost to Client May Drop
Lawyers DP Plan May Benefit Poor

By Alexander Dumas
Of the CW Staff

CHICAGO – A group of lawyers from the Cook County Legal Assistance Federation (CCLAF) is testing a computerized legal aid system that it hopes can slash the costs for the poor of the Chicago area from $50/hr to as little as $2/hr.

William A. London, a Chicago lawyer directing the system's operation, pointed out that the computer will not take over the lawyer's role in legal issues, but would reduce the clerical work and interviewing time that contribute to the higher legal costs for the client.

An associate of London's explained: "If you let a computer ask the questions and crank out the reports, lawyers have more time to do what they do best – make the hard, legal judgments and think up new approaches to cases."

Under the system, the lawyers design the questions and directions for the client interviews at the centers by being interviewed themselves by the computer.

Under the "author" mode, the system is programmed to ask the lawyer questions so it can gather all relevant information about the client interview – what client responses should be recorded for the record or discarded and when the issues being discussed in a client interview should be followed up. This type of author interview will be carried out by the computer for each type of legal category, according to system director London.

When a potential client comes to the CCLAF office, a lawyer decides if there is a computer interview applicable to the problem by asking a few questions. If so, the interview procedure and confidential nature of the relationship are explained.

ID Number

The client then goes before the video terminal with attached keyboard. A paraprofessional or law clerk trained to op-

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VS2 Release 2: Built-In Monitor and Multiple VS?

By E. Drake Lundell Jr.
and Don Leavitt
Of the CW Staff

ARMONK, N.Y. – IBM's next release of OS/VS, rescheduled for general availability June 30, will contain some exciting new features to allow computer users to monitor the performance of their systems and to dynamically schedule the system resources, according to two users who have seen IBM's planning guide for the release.

IBM said: "The initial availability of OS/VS2 Release 2, scheduled for March 1974, will be limited to those accounts requiring Release 2 to meet existing installation schedules. General availability of Release 2, however, has been rescheduled for June 30."

The expected release will also see a change of name of the operating system from OS/VS to VMS (Virtual Machine System), and the release will be known as VMS 2 Release 2 instead of OS/VS2 Release 2, the users said.

Other sources indicated, however, that VMS will not be the new designation for OS/VS2, noting the phrase Multiple Virtual Storages (MVS) "has been heard" within IBM and appears to be a generic term referring to OS/VS2 Release 2 and all future releases.

Although MVS is not an official term, its existence seems to confirm that Release 2 will include facilities for separate virtual storage space for each user partition, an industry observer noted.

The new system will contain a program known at MF-I (Measurement Feature) that is similar to several software computer utilization systems presently available, one user said, noting the details for the system in the planning guide were presently "sketchy."

More Core

This feature, he said, should allow users to measure the resource utilization within the system at all times, even though he noted it would use up additional core since it was a software monitor and not a

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IBM Security Chief Warns Users On Program Costs

By a CW Staff Writer

NEW YORK – The data and programs on which "you spend the most money are not necessarily the most sensitive or valuable," Robert H. Courtney, manager of data security and privacy for IBM, warned users attending the American Management Associations' 20th Annual Systems Management Conference here last week.

Users, he said, therefore have to determine what are their most sensitive programs, and those would probably be the ones that would be of greatest benefit to competitors, he added.

For example, he said, IBM spent the most money on circuit design programs, but it would consider lists of prospective customers more sensitive since they would be of more benefit to competitors, and therefore more likely to be stolen.

While authorization codes are important in providing security for shops,

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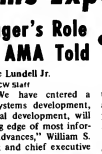
'Systems Expectation Gap Still Here'

DP Manager's Role Greater, AMA Told

By E. Drake Lundell Jr.
Of the CW Staff

NEW YORK – "We have entered a period in which systems development, rather than technical development, will comprise the leading edge of most information processing advances," William S. Anderson, president and chief executive officer of NCR



CW Photo by P. Ward Anderson

told last week's American Management Associations' 20th Annual Systems Management Conference here.

Because of this increasing importance of systems development, keynote speaker Anderson said, the role of the systems manager in corporations would likewise become more important.

Expectations Gap

Presently there is a gap between the expectations of top management for computer systems and what they are receiving from such systems – and this "systems expectation gap cannot be wished away," according to Anderson.

This gap still remains, he said, in spite of the increasing sophistication of systems and equipment, and he warned it could worsen in the year ahead as top management expects more performance from its computer systems while at the same time leaving the DP department with essentially static budgets.

Anderson defined the gap as "basically the difference between what was expected from a system and what it actually delivered.

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Long-Range Planning Key to Advancement

By a CW Staff Writer

NEW YORK – DP managers who take the time to understand the business they are in should have a clear shot at the top position in their firms, according to one man who has made that transition.

George B. Rockwell, who reached his current position as president and chief executive officer of Boston's State Street Bank and Trust Co. through the DP department, said DP managers who learn a company's long-range plans and the needs of the firm's customers were almost "assured of success."

Long-range planning is the key, he said, since it allows the DP manager to relate his personnel and equipment needs to the overall goals and programs of the corporation.

By doing this, he said, DP can be used to make a real contribution where it counts – in earnings per share.

Looking Ahead

Through detailed knowledge of the long-range prospects for a company, Rockwell said the DP manager can play

Other AMA coverage on Pages 6, 7 and 8.

an important part in helping the company identify those projects that have the greatest potential.

At the same time, however, DP managers often do not understand the important "numbers" in a corporation, he said, indicating that DP managers should get more familiar with return on investment, earnings per share and share of market figures for their company – and how DP can work to increase those figures.

"If you are going to interface with top

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Mass. Police Under Investigation For Alleged Sale of Crime Data

BOSTON – Several state policemen are under grand jury investigation here for allegedly selling criminal history material to private investigators who in turn turned it over to credit reporting agencies, it was learned last week.

The investigation is the first to be made under the Massachusetts law protecting the privacy of such information and follows a long probe by the governor's office and the state police, sources close to the investigation said.

The law established an audit trail on the requests for criminal history information from the computerized files, which gave the investigators the first indication that the files might be being abused, the sources said.

From the audit trail, the sources said, it was seen that several state policemen were apparently requesting an inordinate number of criminal histories – more than they would normally need for the performance of their duties.

This information was turned over to the director of the state police and the state police internal investigations unit, which monitored the use of the system and the activities of the policemen allegedly involved in the plot.

Apparently, one source said, the state policemen were selling the files to friends who were private investigators, who in turn were turning the files over to large credit granting agencies such as department stores in the Boston area.

The results of the investigation have

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Honeywell VP Sees 'New Era'

Does Society Want Advances?

LOS ANGELES – "A new era is dawning in man's relationship with the computer," William T. Bayer Jr., vice-president of technical resources planning for Honeywell's worldwide computer operations, told the Town Hall of California here recently. "The real issue of the future is what the social, economic and political structures will permit people (in the computer industry) to do," Bayer said.

Referring to the plethora of technological advances to come, Bayer said: "Technology makes these things possible now or within the next quarter-century. But does society really want them, or need them? That's the real question involving computers in the year 2000.

"In 1968 technology appeared to have answers for everything," he said. "Today we're beginning to be concerned about such things as the human element, the quality of life and the environment. We want to know how technology affects the total human condition."

Citing fears he said once existed among Americans that computers would rule the world, Bayer predicted that "responsible actions" by the DP industry and its customers would dispel by the end of the century the myth that man will be enslaved by computers.

"More and more people are entering the work force who know how to use computers," Bayer said. "The U.S. will not be filled with computer experts, but the U.S. will be filled with people who understand how to use computer power.

"We must learn how to use what we already have," Bayer said. "It is not a question of what is possible from technology, but of what needs to be done for the betterment of mankind."

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Lawyers Aid Plan May Benefit Poor

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erate the terminal types the individual's identification number on the keyboard to either create a new file or recall an established one. From then on, the computer directs the interview.

The clerk can operate the keyboard, but because many of the questions are multiple choice, the respondent only require the typing of one digit or letter. For this reason, London and his associates feel the client should have the option of self-operation of the terminal if he desires that degree of privacy. If difficulties arise in self-operation, the computer is programmed to suggest to the client to seek the clerk's aid.

At the conclusion of the interview, the client record is automatically filed in disk storage. Possible computer printouts from this information include a case summary for the lawyer, a letter to the client containing instructions and a list of information that should be brought to the office for the next meeting, or a complaint that can be filed in court.

More Cases

The lawyer handling the case can change the draft or reject it, said London, but if the lawyer approves the document, the client can sign it immediately and avoid later visits and high fees that accumulate. He added that the document and information retrieval capability of the system will also greatly reduce costs as well as allow the lawyer to handle a greater number of cases.

London noted that CCLAF terminals are staffed with bilingual para-professionals and software is available in Spanish and other languages.

One of the system designers, Attorney William A. Chatterton, is optimistic about computerized legal aid. "We're already convinced that lawyers are going to succumb to this," he explained, because while their time is getting "more and more expensive, the computers are getting cheaper and cheaper."

According to H. Robert Knitter, another designer of the system, the hardware for the Chicago-based system consists of a DEC PDP-11/20 with a 24K core memory, three 2.5 MB disk drives, a dual DEC tape transport, a teletypewriter control console and 10 communications interfaces.

Developed with $250,000 of federal funds at the University of Wisconsin Graduate School of Business, the system will serve the poor in over three-quarters of Cook County, a region of almost 1,000 square miles and 125 towns and municipalities.

Although the CCLAF program is now experimenting with divorce cases, London and his colleagues foresee it handling landlord-tenant problems, credit problems, paternity suits, juvenile cases, personal injury cases and mental health problems. Eventual extension to legal aid programs throughout Illinois is a possibility, according to London.

War and Peace... DP Style

By E. Drake Lundell Jr.
and Alexander Dumas
Of the CW Staff

CHAPEL HILL, N.C. – The State Department may soon be getting help from a computer system to predict the possibilities of war and peace among nations.

Professor Edward Azar, who developed the system now running at the University of North Carolina here, said the State Department had expressed an interest in his work and that he hoped to be a government consultant on such matters "in the near future."

The Conflict and Peace Data Bank (Copdab), which is presently running on an IBM 370/165 operated by the Triangle Universities Computation Center here, is fed up to a quarter of a million news items daily, including information on accusations, charges and threats between nations.

The information, in addition to coming from the public press, is also gleaned from Senate and House hearings, national policy statements and diplomatic sources, Azar said.

The system then sorts and files this information according to predetermined patterns for analysis by political scientists to try to determine how a particular country would react when faced with certain situations such as border struggles, natural disasters or broken treaties.

If the patterns between countries fall into a preset "normal relations range," it indicates that country is not causing tensions or ill-feelings with either its friends or enemies, Azar said.

However, if a country's behavior falls outside this range, the computer system, with the help of political scientists, would forecast that trouble was brewing in that area of the world, he said.

"As an example," he said, "we believe a war will break out between Iran and Iraq in less than four years unless the present trends change. Both nations have fallen out of the 'normal relations range' and this prediction is supported by the fact they had several days of hostility recently."

At present, the system apparently just files and indexes events in such a way that political scientists can then set parameters on the "normal relations range" between nations, but ultimately Azar would like to see the system do its own forecasting "to warn of potential conflicts while there is time to do something about them."

At the same time, Azar said the system could also be used to prevent another conflict like Vietnam. But he indicated it could be used to test strategies such as the "Domino Theory" to see if in fact it was a valid reason for the U.S. intervention in Vietnam.

DPMA Wants Data Act Review

PARK RIDGE, Ill. – The Data Processing Management Association (DPMA) has urged California state senators to give "further consideration" to the Fair Information Practice Act of 1973, which restricts the use and transfer of personal data used by computers in automated personal data systems.

The bill was passed by the California Assembly Jan. 30.

"Even though the bill is desirable from the public standpoint, the dollar burden placed both on the taxpayer and corporations' operating costs is formidable," said Robert J. Marrigan, DPMA vice-president, industry and government relations, and Herbert B. Safford, immediate past president.

A DPMA memorandum urged simplification of the administrative requirements to permit economical and effective corporate processing. DPMA estimates for programming, operational and administrative costs for the first year for a large corporation run to $50,000 a year, and $20,000 a year after that.

"DPMA is definitely in favor of the intent of bills which protect against unethical use of personal information," the memorandum said. However, the control methods and the difficulty of implementation of these procedures is of prime importance to DPMA."

CAI Helps Inmates Get Diplomas

RIKERS ISLAND, N.Y. – A computer-assisted instruction program is being offered to sentenced and detention inmates here.

The computer program is based around a 16-bit minicomputer installed on a turnkey basis by Computer Curriculum Corp. in the Correctional Institution for Men. Dedicated telephone lines run from the computer to teletypewriter terminals in that institution and an adolescent remand center.

The computer, according to Officer Edward Reilly, is set up and programmed to get the inmates ready for high school equivalency exams, with the CPU's entire disk programmed for CAI instruction in English, math, literature, social science and science. It includes Afro-American literature and history as well as Puerto Rican cultural studies.

Each institution has eight terminals and can handle about a dozen a day. Each class spends about an hour at the computer during the "drill session" and then another hour in a classroom with a teacher.

"I'd certainly have to give the first test an "A" for success," Reilly said. "Even though we had no classroom teachers at that time, 31 out of 35 men in the program passed the New York State G.E.D. examination."

The program is funded jointly by the Law Enforcement Assistance Administration, the New York State Division of Criminal Justice and the City of New York.

Mass. Police Probed For Alleged Sale Of Crime Histories

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now been turned over to a grand jury, which is expected to act on the matter in the near future.

However, the case points to a weakness in the law, several sources said last week, in that only the policemen can be prosecuted under the present law because possession of criminal histories is not a crime.

Amendment Due?

Therefore, it is likely that an amendment will be offered to make the "knowing" possession of such documents illegal, which would make prosecutions easier against private investigators and others who might try to get police agencies to turn over the files for private use.

However, it was also learned that several large private investigating agencies are mounting a campaign to get legal authorization to have access to such files – a move that "would make a mockery of the law" if adopted, according to one source.

Economy of Operation Key Consideration in On-Line Programming

PRINCETON, N.J.—The cost factors involved in installing and operating an on-line system for program development should be carefully weighed before a firm commitment is made, according to ADR, the Princeton-based software house. The cost of remote terminal devices and T/C controller may be insignificant when compared to the costs associated with installing and integrating the software into a particular environment and operating it for many hours each day. These combined expenses may far exceed monetary savings resulting from improved turnaround and increased programmer productivity.

A careful analysis should be made of additional resources—larger CPU, more core, more direct access devices—that may be required to maintain an acceptable level of batch production during the hours that the on-line programming system is in operation. Dedicating an entire CPU to program development as is commonly done with TSO or VM is an alternative, but a very expensive alternative, to running both production and development work concurrently on the same machine. Ideally, a remote programming system should operate effectively in a multijob environment, maintaining a high degree of terminal responsiveness without degrading background operations or reducing overall system throughput.

Roscoe Cost Effective

ADR suggests that its conversational text editing RJE system, ROSCOE, meets cost-effectiveness criteria better than comparable IBM-supplied software. ROSCOE provides versatile services to applications and systems programmers as well as to operations, design, and clerical personnel. The system contains data entry and editing facilities, compressed library storage services, and remote job entry and output retrieval functions. Also included are syntax checkers for COBOL, FORTRAN, PL/1 and the Job Control Language (JCL). A unique capability of ROSCOE is its command procedure language which supports terminal I/O operations, and includes decision making, branching, and iterative types of instructions. ROSCOE command procedures are commonly used for job stream generation and prompting (or training) of clerical personnel.

To increase the versatility of the system, ROSCOE monitor services allow an installation to interface auxiliary programs with ROSCOE for on-line execution in a conversational mode. ADR supplies with ROSCOE a limited number of auxiliary programs, including a UTILITY subsystem which provides OS data set management services to systems programmers.

ROSCOE will operate on S/360-40 and S/370-135 CPUs and larger under OS MFT and MVT with or without HASP, or with VS1 and VS2. It supports a variety of remote terminals including 2741, 2260, 3270 and teletypes of all speeds.

The system is generated to the user's specifications and installed by ADR personnel. The installation generally takes about one hour and is followed by classroom training of systems personnel and applications programmers. User guides and detailed system operation manuals are provided; source code is available on request.

The system is available under monthly or permanent licenses which incorporate a 30-day no-obligation acceptance period. ROSCOE is currently installed at 27 sites in the U.S., Canada, and abroad. ADR reports that 15 additional installations are scheduled for the second quarter of 1974.

ROSCOE In Use At VS Sites

PRINCETON, N.J.—Almost half of the existing ROSCOE installations are using one of IBM's virtual storage operating systems, according to ADR, manufacturer of the remote programming package. The most common environment for ROSCOE is an S/370-145 CPU with 512K of main memory operating under VS1. These installations generally have 3330 disc drives and local 3270 display stations. Users report that terminal response time is consistently good, and background batch processing is not noticeably affected by operation of the on-line programming system. One of these VS1 installations recently upgraded to VS2, and ROSCOE was successfully transferred to the new environment. According to ADR, several additional VS2 installations of ROSCOE are scheduled for the second quarter of 1974.

Operates Entirely in Virtual

In a VS1 or VS2 environment ROSCOE operates entirely in virtual storage under control of the VS paging supervisor, usually in a virtual region or partition of 120K. In an OS MFT or MVT environment a minimum 80K main memory partition or region is required. In most cases, installations can change from one operating environment to another without regenerating ROSCOE.

Utility Aids OS Data Set Maintenance

FRINCETON, N.J.—A major new facility has been added to ROSCOE, ADR's conversational programming system. The new capability, called The UTILITY Subsystem, provides on-line OS data set management services to systems programmers responsible for the maintenance of OS and its direct access resources. Working from a ROSCOE remote terminal, a systems programmer can now allocate, catalog, rename, write and scratch data sets; he can also build, find and delete entries in the OS catalog. All operations are password-protected, allowing access by authorized personnel only. The data management functions provided by the ROSCOE UTILITY Subsystem are comparable to those provided by TSO and the IBM batch utility programs.

Runs Under Monitor

The UTILITY Subsystem operates under the ROSCOE monitor and requires about 26K of real or virtual storage. It can be used with other auxiliary programs serviced by the ROSCOE monitor, including ADR-supplied syntax checkers or special purpose programs prepared by the user installation. The UTILITY Subsystem and other monitor programs are supplied as a standard part of the ROSCOE package.

Users at AMA Told to Shop Around

Apply Creativity to Applications, Not Equipment

By Patrick Ward
Of the CW Staff

NEW YORK – "Use your ingenuity on applications, not equipment," and shop your vendors – IBM and the phone company "equal motherhood, but there may be better vendors for your application," William F. Davenport, telecommunications manager for National Bankamericard told an audience of computer users at the American Management Associations' conference session here.

In bringing up a system, get the user involved, Davenport stressed. "If you don't, you end up with a system that is not user-oriented to the degree that you'd like."

The efficiency with which a system is used depends heavily on the operator, he said.

Systems people, financial people, common carrier and vendor representatives should be part of the acquisition team, as should the legal team. But the user comes first, he stressed.

Staff early and get the technical resources team ready early.

Develop in-house expertise as soon as possible. "If nothing else, it prevents snow jobs," he stated.

For example, he said, "Who in your house can say Qtam is better than Btam for your installation?"

Users can also expect better on-the-spot trouble analysis and decisions if they have in-house talent, Davenport stated.

As for programming costs, Davenport asked, "Have you got any idea what your programming costs will be unless you have someone in-house?" One of his vendors once wanted $3,000 for three lines of coding that his in-house people could easily handle, he mentioned.

In the RFP [Request for Proposal] "you should have an outline of the format the vendor should follow in his proposal."

This helps with quick evaluations of what the different vendors are willing to offer in particular categories. It is no trouble for them, but a great help to the user, he emphasized.

Be modular, he added. This allows flexibility and also makes growth easier. Consider applications and software modularity as well as hardware modularity to allow for some downtime safeguards, he said.

Be realistic. A balanced schedule, neither too loose nor too tight is best. "Nobody likes a tight schedule but it brings out the best in you," he said.

But don't underestimate costs of a job, he time it will take and potential growth.

Don't push technology. If new, untried equipment is used, and "you can pull it off on time, within budget and it does what the user expects, you're great. If it doesn't work out so smoothly, you may be out of a job," Davenport warned.

"A devil's advocate . . . is the most valuable man you have in your shop." This person is a "visionary" – get the person who says, "Don't do it that way, you're going to have problems."

Make changes in the system easy. In a communications system there are always changes," he said.

Build the system so it reports when it reaches predetermined bottlenecks in file core and communications line utilization.

Make the man-machine interface easy to aid in training, for example, he noted.

Systems Gap Means Greater Role for Managers

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"The gap is ubiquitous. It plagues business. It creates problems in government. It complicates hospital administration. It troubles educational institutions," Anderson continued.

The problem is caused because "too often systems promoted as money savers and efficiency improvers develop insatiable appetites" for hardware, software and personnel, he noted.

"After over-anticipation, perhaps the next biggest cause of the expectations gap is a lingering misunderstanding of the computer itself," Anderson added, explaining that the industry and users have done a "poor job" of clearing up the lingering misconceptions about computers.

"In the year 1974 there are still those who view the computer as a king or mechanical Moses, capable of leading all and sundry to a promised land where systems problems no longer exist," he stated.

These people often believe the computer is "an instrument that inevitably reduces unit costs. They share the illusion that the computer can do any job well," he said.

Too often, he said, systems people or their assistants don't ask "How can we do it best?", but "How can we do it on the computer?"

No one party is to blame for this gap, he indicated, but top management, systems management and computer vendors all have to share a part of the blame.

Often, Anderson said, there is an "appalling lack of long-range planning" on the part of top management especially relating to the DP function in an organization.

At the same time, Anderson also indicated that many times top management does not consult with its systems people enough in the early planning stages for new systems and that "critical systems decisions are often made at the top without meaningful systems management participation.

"As a result, the systems manager, who must implement the project, is placed in a reactive rather than a creative position."

But systems managers are also often to blame for the expectations gap, he noted, indicating they often focus on "razzle-dazzle" specifications instead of basic conceptual changes that will be reflected in bottom-line results.

In addition, it is said that many "systems managers lack cost awareness, that they don't really understand their organization and its objectives, and that they tend to float so far above the battle that they are incapable of converting concepts into reality," he said.

They also "suffer from a serious occupational disease – the tendency to be systems specialists first and businessmen only in a secondary way," he added.

He also felt that the computer vendors are to blame for the gap because they often tell users "what they should want, instead of responding to what they do want."

To overcome these problems, the systems manager has to become more conscious of return on investment, Anderson noted, adding that the climate for DP developments is better today than before because the people now moving into top management positions are more familiar with systems than their predecessors were.

In addition, Anderson felt top management was giving more attention to long-range planning that than in the past and was conscious of the role that computers and systems could play in the future.

But "there remains a need for continual rethinking of the information needs of the organization" on the part of top management, he said.

In addition to becoming more conscious of return on investment of their organizations, he also said the systems managers should learn more how the overall business functions – "that includes a working knowledge of the requirements of all divisions and departments, not just those which are large paper generators.

"Those who acquire this depth of knowledge find it doubly beneficial. They become more effective systems managers and also an indispensable part of the management team," Anderson noted.

Successful Manager Learns Long-Range Plans of His Firm

(Continued from Page 1)

management in a meaningful way, you have to understand those numbers," Rockwell told a session of the American Management Associations' Conference.

The increasing use of management by objectives in most companies, he said, gives the DP manager a good chance to gain an overview of the entire operation since DP should play an important part in analyzing how well the company is meeting its objectives.

This type of management also allows the DP manager to "interface" with all segments of the firm and to become intimately familiar with the objectives of all divisions or departments in the company.

For example, Rockwell said, any of the task forces set up by State Street always includes a representative of the DP department.

Apparently it is working for State Street, since he noted that although business has increased 50% in the past three years, the DP department has been able to keep up with the work with the same budget it had three years before through long-range planning.

At the same time, he said DP people had to know the needs of an organization's customers, because "if the customers don't like it, there is no need for a project."

Top management involvement can help keep the DP department informed in this area, he added, pointing out that at State Street management sends a monthly publication of customer trends and needs to the DP department.

Users Warned on Spending

(Continued from Page 1)

Courtney said audit trails were possibly more important in order to catch people subverting the system.

Most people, he claimed, are authorized to access the data they attempt to manipulate, so they can only be caught by proper auditing.

At the same time, Courtney said, journaling and auditing might be less expensive than authorization schemes while also promising greater chances of catching someone attempting to criminally manipulate the system.

System Security

Also, he said, users should not worry too much about the possibility of eavesdropping on their central computer centers, but it could be an important factor, he said, in terminal locations because electronic signals could be picked up from offices near the terminal location.

This problem, however, could be overcome by placing terminals away from walls or ceilings like the office housing the terminal, he added.

While there have been no proven cases of wiretapping in the data communications environment, Courtney said it was technically possible and the move toward more terminal- and communications-oriented systems could "invite wiretaping."

The need to include coding and encryption in the computer environment, therefore, "cannot be ignored," he said.

For example, it is extremely important to have some type of encryption for on-line cash-dispensing terminals, he said, to prevent someone from learning the authorization code and dispensing himself all the cash he wanted.

Such a move, he said, "could make the great train robbery look like knocking over a piggy bank."

Will Release 2 Have Monitor?

(Continued from Page 1)

hardware-implemented system.

The second feature to be included in the expected release is a System Resource Monitor (SRM) which is really an internal scheduling system which allows users to set up classes of programs for priority treatment and which will dynamically schedule the resources of the system to meet those priorities.

The SRM system was described as "one of the most comprehensive internal scheduling systems I have ever seen" by one expert in the field.

"The only problem with it," he said, "is that it will take users quite a bit of time to become familiar with the technique and capable of using it to its maximum capabilities."

The system allows the user to specify classes and then to set up priorities within those classes, he said.

It will also let the user establish "threshold" values for the operation of the system, he said, permitting programming of the system to dynamically allocate system resources to accomplish the jobs with the high priorities within set time frames.

The system lets the user specify all of the important values and does not impose those values on the user, the expert added.

For years users and experts in the field of performance measurement and evaluation have contended the major breakthrough in the field would come when monitoring and scheduling equipment were built into the mainframe itself and not tacked on – and apparently that is what IBM will be attempting in the expected release.

However, two measurement experts contacted last week indicated the software monitor was perhaps the less efficient way to proceed, indicating they would rather have seen IBM build in a hardware monitor for the system.

They had nothing but praise, however, for the idea of a software-implemented internal scheduling system as part of the system software.

"The rescheduling," IBM said, will provide additional time to test more completely the program's many new features and functions in a greater number of different customer data processing environments – and thus further improve the release's overall level of quality.

"A major goal during the extended test period will be to gain additional installation and conversion experience that will aid future users," IBM added.

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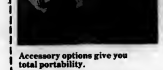

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Data Communications Set To Enter '3d Generation'

By Patrick Ward
CW Staff

NEW YORK – Data communications is about to enter its own "third generation" that will match the needs and capabilities of the latest computer systems, according to Robert A. Kitchener, director of communications, Card Division, American Express.

In his keynote speech last week to the computer networks session at the 20th Annual Systems Management Conference of the American Management Associations (AMA), Kitchener said digital communication nets will comprise the third data communications generation – the first actually designed to transmit data to and from computers.

The third generation may be here before the end of the year, Kitchener mentioned, although "full development will probably take three to five years."

Looking Back

The first data communications generation lasted from 1958 to 1968, Kitchener explained, and involved the adaptation of voice and telegraph services, using modems leased from the common carriers.

Cost per unit of data transferred was high, but there was little reason to innovate because of the restrictive rules in the common carriers' tariffs and the lack of alternatives.

Tariff revisions in 1969 changed that and the second generation of data communications began. Resourceful users could assemble more optimum equipment from a variety of competitive vendors for use on the carrier voice bandwidth analog circuits.

However, "these efforts have met with only moderate success in terms of improved cost effectiveness," Kitchener remarked, "and with little improvement in reliability or error rate."

Worse, the second generation brought "a proliferation of independent, non-standard, application-specialized systems, with little apparent progress toward the development of integrated data networks for large users with many hetergeneous data processing systems.

Third-generation alternatives will come from several sources, Kitchener feels.

DDS This Year

AT&T's Digital Data Service (DDS) is scheduled to start operation this year and will offer leased data channels with improved performance . . . at considerably lower cost than present leased channel rates," he said.

Western Union's plans for domestic satellites, the first to be launched in April, will probably have a favorable effect on rate structures because of the extra capacity they will provide, he added.

Specialized common carriers and packet-switched networks provide additional third-generation alternatives, he noted.

Goldwater's Challenge: Get Involved With Privacy

NEW YORK – "The time has come for the American business community to get totally involved" with the issue of privacy of personal records in computerized data collection systems, Rep. Barry Goldwater Jr. (R-Calif.) told the American Management Associations' conference.

Goldwater challenged the businessmen's group to "begin to think about privacy rights and how to protect them" since "you, of all people, are in the best situation to correct the ills."

Noting the threat to privacy posed by computerized data banks is a "growing menace," the congressman said "it is not difficult to determine the adverse potential of today's technology on the right to privacy.

"What is difficult," he continued, "is making certain our traditional liberties can be secure against growing technological onslaughts against privacy."

At the same time, he said, the worst enemy to personal privacy "is not the computer, but rather apathy and ignorance" on the part of the people of the country and a growing "computer mentality" where people want to store more and more information in such systems.

"The potential of privacy invasion is always present in a sophisticated computer operation," he warned, noting that "remarkably, the misuse of information held about individuals in computer systems has been held to a minimum."

But, he warned, "the potential for misuse is still there and certainly data surveillance has grown to very menacing proportions due to the technological advances which allow such information to be given multiple use and consolidation."

It's the Age of Project Control and User Has Big Role

By E. Drake Lundell Jr.
Of the cw staff

NEW YORK – The Seventies should see the coming of age of project control in computer operations, even though there was not much progress in the area during the 1960s, Charles P. Lecht, president of Advanced Computer Techniques Corp., said here last week.

The only thing that has really changed in the past 10 years, Lecht told a session of the American Management Associations' 20th Annual Systems Management Conference, is that users now know more what to expect in the way of projects from the computer center.

In the future – at least in the next decade – the user is going to assume a more important role in project management, he said, while the needs and desires of the programmers are going to be less of a consideration.

During the 70s, he indicated, there is going to be more emphasis on planning on the part of DP people, simply because no one wants to go through the expense of unanticipated changes that might have been unnecessary with good planning.

Use What's Available

Today there are only five tools that can be used in the sphere of project management, Lecht indicated, even though these tools are "still not satisfactory."

These tools include the creation of specifications, drawing up work plans, resource estimates, status reports and person-to-person meetings.

We have to acknowledge the fact that specifications are generally "lousy" today, he said, indicating "there is a lot of fantasy in most plans."

By realizing this, users can discount the effects of those fantasies and come up with realistic specifications on later iterations of the project, he stated.

Lecht said resource estimates are "hard to come by today," since estimating is still more of an "art" than a science, and the accuracies of estimates vary widely depending on the people making them.

Status reporting, he noted, should not really be thought of as a tool just to inform management of the progress of different projects, but should also keep people working on a program informed of the goals of the project and of their role in the overall system.

This use of status reporting gives the individuals on the job an opportunity to reevaluate their places in the project and the direction they are taking – matters which sometimes get forgotten on large projects, he indicated.

Meetings also serve this purpose, he said, giving people personal contact and guidance about their part in the overall project.

Lecht said the DP manager should not legislate the way the people work or demand obedience, but rather should foster participation and loyalty among the staff.

Keeping the staff happy during large projects is particularly important, he, added, since staff changes in the middle of projects can cause "as severe a setback" to the project as any other factor or combination of factors.

At the same time, there is a "crying need" today for statistics on project management in order to tell who is performing up to par and "what is actually happening" to the entire project.

There is also a strong need today for studies of the overall impact of automation on corporations, he noted, because automation has been causing some "weird phenomenon" within companies that haven't been fully explained.

The computer function "contains the seeds of destruction" of the corporation as known today, he said, but hopefully holds the "seeds of rejuvenation."

Why Is Crime Up?

NEW YORK – While data security and auditing techniques have not kept pace with advances in computer technology, criminals have – and this accounts for the rising rate of computer-related crime, Donn B. Parker of Stanford Research Institute told the American Management Associations.

Parker, however, indicated the problem might be at its peak now since better security techniques are being developed and auditing practices are becoming more refined.

Secrets of Efficiency — *Greatest Savings in Applications*

U.S. Study Pinpoints Tricks to Improve Operations

By E. Drake Lundell Jr.
Of the CW Staff

NEW YORK - Many of the tricks of the trade that make computer operations more productive and efficient are learned from experience and common sense.

With this in mind the U.S. Government has just completed in-depth investigations of 43 particularly efficient computer operations in an attempt to learn the secrets of their efficiency, according to Dennis R. Chastain, computer systems performance analyst with the General Accounting Office.

The study, which investigated 13 military installations, 11 civilian installations in the government and 19 commercial operations, found the improvement tricks fell into six categories: applications software, systems software, operation considerations, scheduling considerations, hardware considerations and workload considerations.

Clearly the greatest savings can be made by improvements in applications programs, he indicated, based on the results of the study.

Resource Use

One way in which users identify programs as candidates for improvement, he said, is to establish thresholds on resource use by different programs and take a hard look at those programs using a lot of resources.

To do this, some users require the computer operators to fill out forms on all programs and their resource utilization, Chastain told an American Management Associations' Conference, noting that one installation even has a tape recorder at the operator's console for him to dictate such information during the day.

Then, to locate the specific problems with those programs, he said most successful users would turn to some type of monitoring system or simulation of the program.

With optimizers to help overcome the problems, he said, users can reduce their core requirements from between 0% and 42% and gain a 2% to 24% reduction in run times on programs.

In cases where the users did a lot of sorting, he said they had found they could improve their operation by two to three times through the use of more efficient sort routines than using the ones included with their equipment.

Programmer aids are particularly important in improving the operation of application programs, Chastain said, because if programmers are producing the most efficient programs possible, the later corrections and reworking would not be necessary.

The efficient shops studied place a great deal of emphasis on training of programmers to accomplish this goal, he said, both training in efficient programming methods before they got on the job and in-house training later to keep them up to date with new techniques and tips for more efficient programming.

In addition, he said, several of the successful shops have special assistance groups that would review all the programs written by programmers and help make them more efficient.

In one installation, Chastain said such a group was credited with saving more than $200,000 yearly through the increased efficiency of its programs.

In the area of supervisory software, Chastain felt that savings could be achieved through a process of tuning the system by determining what parts of the system should be internal and what on external storage.

Simple tuning, he noted, saved some installations $250,000 and more.

Success but...

The few installations that had developed their own specialized supervisory software had great success, he said, reporting an average 25% reduction in system overhead and between 30% and 90% increases in throughput.

But Chastain warned that such development is tricky and requires talented people. In addition, he noted it is a continuing expense and not a one-shot item.

Improving operations of the center is one way that is extremely important, he said, and one that is often overlooked by many managers.

The computer operators themselves are very important in this area, he said, and their efficiency can be rated through such factors as rerun analysis, observation and analysis of data on the system operation.

Many of the efficient users assign a value to errors and charge it against the record of the different operator teams to determine the most efficient.

By monitoring the activity of operators through rerun analysis, one user was able to reduce the amount of interruptions on the system by 75%, he said.

Observation of the computer room can also be used to determine such things as the effect of visitors on the operation and the efficiency of the computer room layout, he added.

Through system accounting data, operators can be rated on such things as downtime per shift, jobs per elapsed time and amount of idle time on the system.

There are many tricks to improve the efficiency of operators, he said, adding that efficient users make sure that documentation needed by the operators is readily available and foster competition between operator teams as a way of making them more efficient.

Training of operators, Chastain found, is also extremely important, explaining that one of the firms surveyed was able to reduce its rerun rate by 80% after an intense course for operators on the major causes of reruns. In this area, he said, technical bulletins from the senior staff directed to the computer operators could be an effective aid.

Scheduling work on the system is another method to make the shop more efficient, he said, noting that automated scheduling is vastly superior to manual methods and that internal scheduling of system resources can have a real payoff.

Almost all of the efficient shops have a system of identifying hardware bottlenecks through monitoring or performance measurement which allows them to overcome problems and upgrade just those resources that are overutilized.

All users surveyed also try to develop the most productive workload for their systems, Chastain said, even though he admitted it is sometimes hard to get people to take non-productive jobs off the system.

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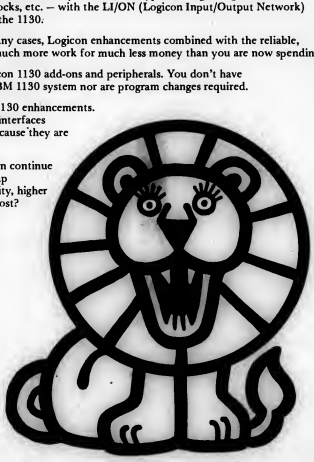

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Program Mixes Theoretical With Practical

Pollution Game Promises Students, Firms Real Results

By a CW Staff Writer

PITTSBURGH — A computer-based game which mixes theoretical with practical applications is being used to train students and aid government agencies and industries in heading off air pollution disasters and in planning strategies to deal with pollution problems.

The major uses of the Air Pollution Episode Game (Arpege) are:

- For classroom work as a supplement to lectures and source material.
- For professionals in air pollution episode control.
- For pollution source managers with economics as a consideration.
- For research scholars as a tool for behavioral and administrative studies.

Arpege was begun early in 1971, resulting from a joint project between Carnegie-Mellon University's (CMU) Environmental Studies Institute and the Air Pollution Control Board of Allegheny County.

A preliminary version was developed and tested with undergraduates in 1972; a full version was tested with participation by actual industrial managers, bureau personnel environmental leaders and educators. Arpege is currently run in Fortran on an IBM 360/67 and on a Univac 1108 with a Fortran compiler.

Conflicting objectives characterize the behavior and decisions by each player.

Players are given roles as managers of the major pollution sources, as members of the regional air pollution control agency or as judges who rule on disputes.

Computer-implemented models simulate industrial operations, weather and meteorology, atmospheric dispersion of pollutants and resulting air quality and associated adverse effects.

The Arpege program was written at CMU by Prof. Anthony S. Walters, School of Urban and Public Affairs; Prof. Matthew J. Reilly, Environmental Studies Institute at CMU; and several students.

Geographically Flexible

Arpege considers short-term episodes rather than long-term air pollution problems. "The beauty of Arpege is that it is easily adapted for a particular geographic region," Walters said.

Each time the area of play is changed, a whole list of variables, including land use, weather conditions, prevailing winds, etc., has to be changed. Once it is programmed for that area, however, the only input is changes in decisions that students make concerning particular plants or laws, Walters added.

Three Phases

The game is divided into three phases: episode planning and preparation; simulation of an episode; and analysis and evaluation of players' roles and strategies.

The last phase provides government officials and pollution source managers with "mutual understanding that can be valuable in ameliorating air pollution problems," Walters said.

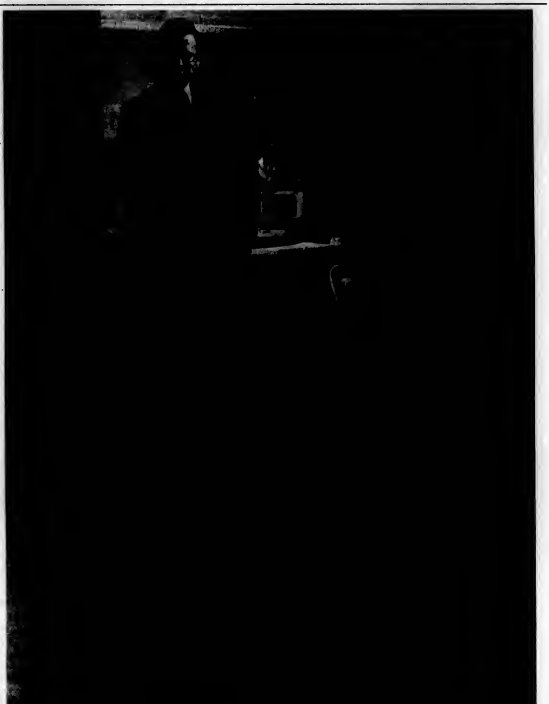
"There is no specific winner of the game," Walters said. "Every time a set of decisions is put in, they affect the status of the plants, air quality, etc., in this hypothetical Arpege county.

Batten the Hatches

"At some point, if weather conditions get bad enough, you get air pollution episode conditions and these have to be met by either cutting down on plant pollution or by enforcing laws to cut back production," he said.

Though the players would never "wipe out" the population, he said, they could receive printouts stating that pollution levels are so high that their children are being kept home from school or that no traffic is being allowed on freeways due to the carbon monoxide level.

A private consulting firm is utilizing Arpege in California and several industrial firms and universities have ordered copies of the game from CMU.



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Bank Finds Way To Cut Turnover

By Toni Wiseman
Of the CW Staff

HOUSTON — Career pathing, combined with flexibility and caring, is the way to decrease personnel turnover and improve operations in a DP shop, a Computer Caravan workshop was told here recently.

Scorning abstract concepts of promotion, the Bank of the Southwest has developed a concrete personnel flowchart, so that all employees know exactly how far they can advance and what their alternatives are along the way, Mickey Metcalf, DP manager, told workshop attendees.

'Better for All'

His shop has instituted some other procedures, all of which, he said, make the operation more satisfactory and efficient.

For instance, each employee and his superior decide on the worker's goals and how and when performance should be measured against these goals. "This becomes a signed contract between the man and his superior," Metcalf said.

At the Bank of the Southwest, Metcalf went on, much effort is expended to make sure personnel are working where they are best used and most capable. "If a man chooses to train for programming and we find out he just can't hack it, we counsel him to try something else," Metcalf said. "If the guy doesn't agree with us on potential, I'd rather lose him at this point than later when his productivity has gone down through discontent."

The bank, he said, moves people where management thinks they can do the best job, even if this means people going 180 degrees out of DP operations. One supervisor, for instance, is currently in charge of customer contacts.

Regular Rotation

Programmers are assigned to jobs on the basis of availability and interest, but all are rotated on a regular basis. "You can't afford to have a bunch of specialists. You come to depend on them and then you can't afford to lose them so you cater to them, and you can't afford that either," Metcalf said. "I'd rather have five men competent in the same five areas than five specialists in each of those areas."

Another move which reduced turnover, he noted, was the addition of technical writers to the staff. "The secret to success is making human beings more effective in their environment," Metcalf said. "A programmer doesn't want or like to code, and if he's coding, he isn't programming and you're not using your resources."

The bank, he said, has found that one tech writer can satisfy the documentation load put out by two or three programmers, and therefore he has seven tech writers and 22 programmers.

All this, he concluded, has reduced the turnover rate in DP from 35% in 1968, to 15% in 1970 and 4% in 1972. "We only lost one person out of 93 last year," he noted.

Editorials

Suing for Privacy

Computer users are beginning to make themselves heard on the nature of legislation that is certain to govern how they organize and use computer files.

And not a minute too late. Some of the suggestions for safeguards contain logic which can best be deemed questionable.

For example, one proponent of privacy safeguards suggested the best way to stop abuses is by suing the alleged perpetrators of wrongdoing.

We have always advocated the avoidance of litigation, and we do not see the threat of a citizen lawsuit as presenting any real incentive for a credit bureau, police agency or large educational institution to change its policies on information handling.

Furthermore, the average citizen has neither the time nor the financial resources to sue the holder of an erroneous record (which could be the cause of unemployment).

The citizen lawsuit is a last resort, and suggestions that it be used as the normal means of protecting privacy are irresponsible.

'Total People'

The unsophisticated data processing manager is on his way out of the American business scene.

Many recent events point to the need for managers to be concerned with corporate policy and goals, social and legal implications of computing, and business principles in general.

One of the government's top computer experts, Dr. Ruth M. Davis of the National Bureau of Standards, reported to the Federal Executive Board that it is "technological suicide" to introduce computers into one part of an organization without considering the effects of that change on other parts of the process.

The computer, she suggested, is just one part of a process of change in management or operations, and should not be considered as "an end in itself."

But given the propriety of computers in business and administration, how does one make them more meaningful?

The president of NCR told members of the American Management Association that the role of systems managers in corporations will become more important, and systems development, rather than technical development, will comprise the "leading edge of most information processing advances."

Overanticipating the benefits of automation has caused problems for DP managers in corporate board rooms, possibly accounting for the scarcity of computer people as chief executive officers.

But the increasing importance of the computer function and the institution of long-range planning for the application of technology to corporate problems could change this.

DP managers must be ready for their changing role, however, and this means relating to the long-range and policy goals of an organization, not simply implementing those policies that might help achieve goals . . . not simply relating to operational problems at the expense of long-range goals.

And if this isn't enough, we are beginning to hear more and more about legal challenges to the use of computers in keeping records. Serious questions are also being raised about whether society wants all the "benefits" that computers can offer since, as a vice-president of Honeywell said last week, "We want to know how technology affects the total human condition."

But what all these events indicate is the need for computer people to be "total people."

After years of warnings about the need to broaden our interests and education, evidence is piling up supporting those who issued the warnings.

Letters to the Editor

Will I Be Programmer Or Microprogrammer?

In reference to "Odds Stacked Against Employment of Programmers" [CW, Feb. 27], a much better analogy would be the recent change from discrete semiconductor to integrated circuit technology. This comparison is particularly interesting, since one of the main factors contributing to the increasing programmability of the hardware is the integrated circuit.

With the advent of the integrated circuit, an electronics engineer, especially a digital one, was confronted with two main choices. If he liked the nitty gritty work, he could work for an integrated circuit manufacturer. Of course, he'd better be prepared to work to a new set of standards. Or he could turn into a systems designer, in which case he might as well forget much of the electronics he ever learned.

The programmer of tomorrow will have a similar choice. If he likes the nitty gritty, he will probably end up working for a computer manufacturer, writing microprograms for instruction sets that allow direct execution of higher-level language statements.

With the increasing use of writable control store, compilers and interpreters will be written almost completely in microcode. This kind of work will require a much better understanding of the hardware than most of today's programmers have, plus a disposition for highly detailed work.

If, however, he would rather work with overall concepts, and put to use the higher level languages and machines that are being developed, he needs to study the latest languages, data base management techniques and some of the more usable artificial intelligence concepts.

Donald E. Tarbell
Miraleste, Calif.

Cobol Professionalism

The Cobol Clinic has offered some provocation that I think should be further discussed in reference to the DP professionalism that many desire. One facet of professionalism is the consistent adherence to stated goals, but the Cobol Clinic is encouraging exactly the opposite.

Specifically, Cobol is usually utilized to meet several objectives, such as source program readability, programmer effectiveness and machine independence. (There are other reasons, but these three are probably widely accepted.) If these are valid reasons, we should strive to meet them as often as possible when we do use Cobol.

In contrast, the Cobol Clinic column is replete with examples of Cobol which defeat these objectives. The extent to which the contributors have gone to produce machine-dependent efficiencies, at the expense of program readability, demonstrates inconsistent behavior or a commitment to Cobol for reasons other than the three cited.

It is my judgment that we need to state our objectives, plan to meet those objectives and then adhere to that plan until a better one is established for an entity (installation or industry). Cobol could then be selected as the way to meet those objectives.

Finally, program development should be administered to meet the objectives as well as possible. If we attempt to meet them only superficially, then we are being unprofessional in our conduct and should rightly be called technicians.

The ideal is to be predictable and consistent. The objectives themselves are negotiable. Machine dependence is a very cost-effective objective in some situations. And if that is the case, machine efficiency and dependence could be better achieved with assembly language.

In summary, let us encourage each other toward professionalism as a reputable way to do business by what we say, do and publish.

Philip N. Bergstresser
Systems Programmer
TRW, Inc.
Vandenberg, Calif.

Ads Turn Him Off

I have a real problem with advertisements and *Computerworld* articles which imply that without any consideration customers should use 360 equipment rather than 370 equipment. I would not be so disturbed if users were encouraged to consider the cost/benefit ratio of 360s to 370s.

My criticism of this type of advertisement has nothing to do with any "allegiance" to IBM. I manage a shop that has a 370/158, a 370/145 and a 360/50; 48 Memorex disk drives; 25, 3420-type tape drives, some from IBM and some from STC; Sanders data communications systems, and a host of I/O peripherals from a leasing company and/or IBM depending on the expected life in our shop.

Each of the hardware decisions in our shop was made on its own merit. And all three of the CPUs are leased, each one under the best plan available at that time.

I am galled by the implications of some advertising (and many of *Computerworld's* articles) that customers do not need to consider the 370s as they are more expensive than 360s and the performance/cost ratio is not justified. It may or may not be, depending on unique situations. We have found that for on-line processing 370s offer a level of service that we could not attain on a 360 because of overall hardware reliability of the CPU, automatic recovery and retry features of the 370 and the extensive logging of hardware failure conditions on the log file for use by the field engineer.

This type of advertising may get a number of customers who don't think (and who may be presently under IBM's wing for that reason), but this type of advertising may also turn away a few customers who would be willing to consider 360 equipment on the merit of its intended use and cost benefits.

L.L. Jones
Vice-President
DP Operations
First & Merchants Corp.
Richmond, Va.

Computerworld welcomes comments from its readers. Letters should be addressed to: Editor, Computerworld, 797 Washington St., Newton, Mass. 02160.

John V. Atanasoff, DP Pioneer—Part II

Concept of Digital Computer Didn't Come Easily

By Georgia G. Mollenhoff
Special to Computerworld

Computer history has been rewritten as a result of a recent court decision crediting Dr. John Vincent Atanasoff as the man who invented the digital computer. This series looks at the background of that invention and at the man whose work has finally been recognized.

With the exception of two years spent at the University of Wisconsin where he obtained his PhD in math in 1930, John Atanasoff was at Iowa State College in Ames from 1926 to 1942.

Frustrated by the cumbersome systems equations and other complex calculations while working on his doctoral thesis at the University of Wisconsin, Atanasoff urgently needed a device with greater computation capabilities than the tabulating machines then available. The twin forces of a father who was an electrical engineer (who exposed the five-year-old John to the theories of electricity involved in lights, batteries and bells) and a mother gifted in mathematics combined to produce the theoretician-technician who one day would give the world the vital apparatus for reducing massive calculations to manageable proportions. Thwarted by the necessary plodding to solve equations he dismantled desk calculators to determine how the "carry" mechanism worked and how it could be reversed to "borrow" for subtraction.

The need for a calculator of great capacity was emphasized when Atanasoff returned to Iowa State in 1930 as an assistant professor in mathematics and later in physics and was concerned with guiding post-graduate students in theoretical subjects, both doctoral and masters degree candidates.

In 1934 Atanasoff speculated that IBM punch card tabulating equipment could be modified to solve complex mathematical equations. He and Prof. A.E. Brandt of the statistical department tinkered with one of the machines to enable them to analyze complex spectra and roused the ire of an IBM serviceman who raised vigorous objections, and which brought a critical letter from the company.

One Cold Night . . .

Frustrated in his efforts to think through his vague concept for a device to speed the calculations which were hindering progress in theoretical mathematics, one cold night in the winter of 1937-38 Atanasoff threw on a heavy coat and rushed out of his office in the Old Physics Building. Driving his Ford V-8, he raced out of Ames on Highway 30 going east. He had no goal; he was simply moving at a furious enough pace to require concentration on his driving and force from his mind the jumble of ideas which he could not sort out in an orderly scientific fashion.

Still paying no attention to where he was going, he dropped down to Highway 6 at some point and nearly 200 miles later found himself crossing the Mississippi at Davenport. Two or three miles farther the lights of a roadhouse became visible at the top of a hill and he went in, shucked the bulky coat and ordered a drink. Before he was served he realized the tension was gone and the scrambled concepts began to fall into place.

Alone in that unlikely atmosphere the embryonic computer began to take shape in the young physicist's mind as the myriad details which had tormented him in his laboratory found themselves out. Four unique principles were clarified at this time and became the basis for his machine-regenerative memory, logic circuitry, serial calculation and the digital approach which utilized the base two or binary system, rather than the standard base 10. He did not write down his ideas except possibly a few jottings on scraps of paper, but satisfied, he returned to Ames 10 hours after his flight.

Back in Room 52 of the Old Physics Building on the campus over the next two or three days, Atanasoff set down on paper the basic theories worked out in his solitary deliberations in the little tavern on the hill. He recognized that he had the answers, but he also realized the peripheral equipment he needed did not exist and would have to be invented and constructed.

A year later he requested funds from the Iowa State College Research Council and he was able to hire Clifford Berry, a graduate student from the Ames area, with that grant of $650. Most of the money went to pay Berry and the rest was used for material to construct parts. The millions spent today make that small sum incredible. In the fall of 1939 they started building the prototype. Before this was completed, however, initial steps were undertaken on the first actual operational computer.

Mauchly Expresses Interest

In December 1940, after work was begun on the Atanasoff-Berry Computer, Atanasoff attended a meeting of the American Association for the Advancement of Science in Philadelphia where he met Dr. John Mauchly who expressed great interest in the machine being constructed at Iowa State. Mauchly had been experimenting in analog calculating devices which had been considered but rejected by Atanasoff because "it was short on accuracy."

Letters from Mauchly in January and March of 1941 demonstrated his continuing curiosity: "Need I say again that I await with some suspense the time when you will be able to let me have more information?" and "Is there any chance you can now disclose more information?".

Atanasoff invited him to come to Ames, study the device and discuss other related ideas Atanasoff was mulling over. While he was a guest of the Atanasoffs Mauchly was permitted to read, but not take back to Philadelphia with him, the comprehensive manuscript Atanasoff had prepared in August 1940. Berry and Atanasoff completed significant material in theory, design, construction or operation of their ABC.

When their work was finished in the spring of 1942 they had the satisfaction of having developed and constructed an automatic electronic digital computer capable of solving large systems of simultaneous linear algebraic equations, employing the new computing techniques Atanasoff had invented.

By this time the U.S. was at war and since the ABC and related research were not war-connected, Berry was subject to the draft. Before that war would be over, the computer would play a vital part in the development of the hydrogen bomb.

At that time both men moved to jobs where their knowledge and training would make a direct contribution to the efforts of the nation struggling to make up deficiencies in equipment and material. Berry went to Pasadena to take a job with Consolidated Engineering where he became an expert in mass spectographs, and Atanasoff accepted a research position with the Naval Ordnance Laboratory (NOL) in Washington, D.C., where he became head of the Acoustics Division.

Friendly Help

Prior to his leaving Iowa State an agreement was reached that the college would obtain patents on the ABC, but that was never accomplished. When Iowa State lagged in taking action, however, Atanasoff on his own initiative located a man skilled in the mysteries of obtaining patents and made preliminary drawings and specifications for his perusal.

The lack of action was discouraging and Atanasoff decided he had been passed by and gave up. He could have forced the college in the courts but one gets the impression that controversy is distasteful to this man. It is the stimulation and excitement of research which gratifies him.

When Atanasoff went to NOL, Mauchly, now at the Moore School of Electrical Engineering at the University of Pennsylvania, was still avidly interested in computers.

(Continued on Page 16)

Technical Revolution Continues

Accelerator Challenges Tradition of 'Mid-Term Kicker'

The 1974 technical revolutions continue. The most recent – the Cambridge Memory Accelerator for the IBM 370/155 – follows the pattern already established of effectively attacking the 20-year-old traditions that many of us have come to consider as laws of nature.

In this case, the tradition which is being attacked is the conscious marketing of "hobbled" machines – that is, machines which have been slowed down in some way so the user gets less value from the machine than they are able to provide.

Hobbling machines dates from the beginning of computer families. Both the Univac Solid State and the IBM 1400 families had hobbled versions – systems in which a card or two was left out or specially inserted so the user could only use part of the speed of the system, or part of the available memory.

Originally, hobbled machines were used mainly for fire sales, resulting either from technical obsolescence, or else from overproduction. It did not take long, however, before hobbling became a conscious design tactic for marketing purposes.

There were three areas where hobbling could be practiced:

- Low-Entry Systems – Hobbling was used to provide a strictly limited, cheap system that could be sold easily, but which would soon be outgrown. Then a larger and more expensive system could be sold without any great worry about meeting competitive prices, as the programs already written locked the buyer in to the particular vendor.
- No-Development Cost Systems – Internally, any system is examined on a development cost/market possibility basis. Hobbled systems effectively had no development costs; the costs had already been expended on the unhobbled system. This allowed budget cutting at the design phase.
- Anti-Purchase System Designs – This is in some ways the most sophisticated hobbling tactic of all. Most major computer companies discouraged purchased systems, in favor of rented ones. When the volume of purchases rose beyond expectations seven or eight years ago, hobbling was seen as a means of discouraging purchasing, through attacking the resale value. The concept, based upon a radical change in a system about halfway through the product life, was called a "mid-term kicker."

This practice was supposed to keep the value of the system down – and the more obvious the hobbling, the more successful the tactic was expected to be. Supporters of this tactic pointed to the comparatively low market price of the 2 μsec Model 30 compared with the price of the 1.5 μsec unit. This had not been designed as a mid-term kicker – but happened to have some points in common.

There seemed to be little that could be done to stop successful use of these tactics and the consequent scrapping of customers. Only the few mainframe manufacturing firms themselves were supposed to have the expertise to safely change any wiring, the power of control over maintenance, etc., was also a strong deterrent.

But the events of the last few years – exemplified by the Cambridge Memories 155 Accelerator – have changed all that. It now appears that outside technical expertise is capable of substantially circumventing these hobbling tactics.

The key physical element which hobbled the 155 was the speed, or rather the lack of it, in the main memory. The original speed of the 155 was 2 μsec; later a 1.5 μsec version was introduced, commanding a considerably higher price.

Until recently, it seemed impossible for users of the slower system to get full power from their systems. But the 155 Accelerator has come on the scene in a timely fashion. It uses high-level technology, not just plug-for-plug effects. And functionally, it releases much of the unused, hobbled power of the 155 central processing unit. Indeed, it is expected to release as much effective net power as the virtual storage versions of the same systems.

The lesson is clear: 1974 technology is not simply the sole prerogative of a number of mainframe manufacturing firms. There no longer seems to be a requirement to buy in a seller's market. And that is as much of a 1974 revolution as the 155 Accelerator.

Unhobbling the IBM 370/155

The Original 370/155
A slow (2 μsec) IBM memory resulting in wasted processing cycles when data is stored or accessed from the main memory.

The IBM Mid-Term Kicker
A faster (1 μsec) IBM memory installed, but only in conjunction with virtual memory circuitry, making it a 370/158.

The Unhobbled Version
A faster (under 1 μsec) non-IBM memory with special logic circuitry that permits the waste of processing cycles to be reduced by an estimated 22% without requiring virtual circuitry.

Digital Concept Didn't Take Shape Easily

(Continued from Page 15)

He had written a highly significant letter to Atanasoff after his June 1941 visit. Dated Sept. 30, 1941, and addressed to "Dear J.V." he posed the question:

"Is there any objection, from your point of view, to my building some sort of computer which incorporates some of the features of your machine? . . . Ultimately a second question might come up, of course, and that is, in the event that your present design were to hold the field against all challengers and I got the Moore School interested in having something of the sort, would the way be open for us to build an 'Atanasoff Calculator' (a la Bush analyzer) here?"

The letter closed "Sincerely yours, John W. Mauchly" but was not signed. In anticipation that the letter's authenticity might be challenged, Honeywell lawyers revealed the extensive research it had conducted on distinctive type defects. Mauchly subsequently admitted he had written the letter.

At the Moore School, Mauchly began working with Dr. J. Presper Eckert on a project which eventually became the Eniac, developed for the U.S. Army Ordnance Corps which started funding them in June 1943, though commercial rights were held by the University of Pennsylvania.

In March 1945 Eckert-Mauchly pressed the university to recognize their commercial interests in return for assurances they would help the university fulfill its Army contract. Unhappily recognizing the necessity for cooperation with Eckert and Mauchly the university yielded any patent rights obtained based on the work for the Army.

However, one year later in 1946 Dean Pender of the University of Pennsylvania demanded they subjugate their personal commercial interests to the interest of the university or terminate their employment. They submitted resignations effective March 31, 1946. They filed patent applications for Eniac June 25, 1947.

Sperry Rand eventually acquired the patent rights from Mauchly and Eckert, but since Dr. Edward Teller in the Minneapolis trial testified he had used the Eniac for calculations on the hydrogen bomb more than a year earlier this was one factor in Judge Earl Larson's declaring the patent invalid. Public use of an invention more than one year prior to application for a patent renders that patent invalid.

Part III details how Atanasoff survived the pretensions to his invention of the first computer and emerged as the "real father." Now in his 70s, Atanasoff refuses to rest on his laurels.

Letters to the Editor

CPP Decides to Disband

The active members of Computer People for Peace (CPP) have decided to disband. This is a painful decision for those of us who have been involved with CPP for many years.

For this reason we have tried to keep CPP and *Interrupt* going even as local activities declined. The interest is still there. In the past year, CPP has received more mail and requests for literature than in any previous year. But the realities are that it takes a strong local group to keep the organization going and that *Interrupt* cannot be written or distributed without input from groups actively involved in research and action groups.

While CPP can no longer do this, our friends in Science for the People (SftP) would like to continue relating to computer people. SftP is a national organization of scientific and technical workers committed to the policies and concerns that CPP represented.

We believe that SftP, through its organization and magazine, can fill many of the needs that CPP and *Interrupt* met over the last six years.

New York Steering Committee
Computer People for Peace
291 Sterling Place
Brooklyn, N.Y. 11238

SOFTWARE&SERVICES

Random Notes

Independent Sort Handles Fixed-Length Nova Records

PLAINVIEW, N.Y. – Data General Nova users under RDOS or DOS can sort sequential, random or contiguous files of fixed-length records with a Disk Sort package now available from GP.C Services, Inc.

Records can be up to 256 words long, but blocked records can be handled only if the blocks themselves are not more than 256 words long, the company said.

File parameters and sorting instructions – sort keys, ascending or descending sequence, etc. – are entered as the programmer uses the sort, which is set up as a subroutine, written in Fortran IV.

The routine requires 2,300 words of memory plus room for an internal buffer which is defined by the user but must be a minimum of two records in length.

The package can be purchased for $950, from 41 Burton Ave., 11803.

Object Decks Repunched, Listed by Utility Package

ANAHEIM, Calif. – Object decks can be repunched to incorporate changes from REPLACE cards, or listed in hexadecimal or Ebcdic characters, column by column, with the X4747 program from Pilkerton International.

The listings are formatted and key words such as TXT, RLD, ESD and END are shown to identify the type of card being printed. The program will work on any OS or VS system, the company noted, and it is available in both source and object code for $195, from P.O. Box 6372, 92806.

Call-a-Computer Network Gains 'Inform' Retrieval/Report Tool

SAN PEDRO, Calif. – Users of the Call-a-Computer remote computing network can perform data retrieval, analysis and reporting operations with the Inform English-like programming language recently installed by the network.

Whole business applications can be structured around Inform facilities, and the work can be done by the user or by the network's technical staff.

Updating of the application coding is also simplified under Inform, he added, from 29000 Western Ave., 90732.

'Mailpac' Bows on Bowne

NEW YORK – Organizations that frequently use medium to large mailing lists can build and maintain their files, and produce customized letters or mailing labels with the Mailpac service on the Bowne Time Sharing network. Work under the service is initiated at a remote terminal but printed on high-speed printers linked to Bowne's IBM 370, a spokesman noted from 345 Hudson St., 10014.

English Firms Asked:

Is One Assembler OK for All Minis?

By Don Leavitt
Of the CW Staff

MANCHESTER, England – In a move that may have ripple effects around the world, the National Computing Centre (NCC) has awarded contracts to study the feasibility of a standard assembler language for a number of minis.

A spokesman for the government-backed research organization said minis in the initial study will include the DEC PDP-11, Hewlett-Packard 2100, Honeywell 316, Data General Nova and the GRI 909. Also, the Digico Micro 16, Business Computers Molecular 18, GEC 2050, Computer Technology Modular One and Philips P800.

Universality Sought

The so-called Unisym project is intended to provide a universal language and the software system that would translate the source language into machine code for any of the appropriate minis.

Examination of elements and structures that might go into the language is being handled by Synergy Software (in Hitchin, Hartfordshire) while the technical problems of writing the universal assembler system are being checked out by London-based Computer Analysts and Programmers (CAP).

Common Instructions

Unisym aims to find, in the machine codes of various minicomputers, a common set of instructions or combinations of a few instructions which are equivalent to the same set of common instructions within the machine, and which can be identified by a common act of mnemonics. These would then become the universal language.

The chief problems of this procedure, according to *Computing Weekly*, are to avoid assembly language instructions too complicated in machine language terms, and to avoid including a multiplicity of instructions performing only slightly different tasks.

Although the software being studied by CAP would strictly be termed an assembler, the newspaper said it is expected to be more like a high-level compiler.

The feasibility studies are expected to be completed in April. Concurrently, NCC is investigating the market potential for such a language. The Centre has surveyed OEM users of minis to determine typical portability problems encountered, solutions suggested and the price users would pay for a Unisym type compiler.

If all the studies find the project feasible, development contracts will be awarded, possibly under the Software Products Scheme, by which the government makes money available for development of rather speculative software products.

NCC itself is already working on a pilot version of the compiler which should be completed within three months, a spokesman said. It would not necessarily bear any resemblance to the final version of the language, when and if it appears.

NCC was set up in 1966 to improve the efficiency of the use of computers in the UK. It has, in the current year, a grant of about $1 million from the government.

Beyond that, its work is supported by membership fees from hardware and software manufacturers, commercial and industrial users, universities and government agencies. Feea are based on the members' size and type of organization. The Centre, this year, has a total budget of about $2.5 million.

'QCM' Times, Adjusts, Reports User's Performance Under OS

PITTSBURGH – Users of IBM's Operating System can measure their installation "more accurately than with IBM's SMF," improve that performance "significantly" and report the results in terms of time, dollars and percentages, with the Quantitative Computer Management (QCM) package from Duquesne Systems.

Software within QCM includes a Timing Module that measures the time of every activity and of every component in the system and a Regulator Module that analyzes and reschedules the system's activities, second-by-second, to optimize its operations.

In addition, a System Performance Module produces reports of the system as measured by the Timing Module and improved by the Regulator; and a Cost Analysis and Billing Module applies the timing measurements to costs to produce reports and billing data for any time frame or in any form desired.

The Timing Module's continuous timing of all activities provides accuracy, repeatability and equitability unattainable in other systems currently available, which tend to sample only certain measurements. The repeatability is reflected in the billings which are not affected by varied job mixes, Duquesne noted.

On-site user training and continuing support by Duquesne personnel; the user's ability to redefine the optimization goal of the regulator; and the flexibility made possible through the parameter -card-driven report modules combine to make QCM "more than a software system," the vendor contended.

In use, the software is imbedded in IBM's OS and takes no significant storage of its own. The complete QCM package is available on license for prices ranging from $1,400/mo for small installations to $2,000/mo for large ones, the company said from Suite 1151 in the Park Bldg., at 355 Park Ave., 15222.

S/3 Gains Disk Use for 370 RJE, Control Software for Terminals

WHITE PLAINS, N.Y. – The System Control Program (SCP) for the System/3 has been enhanced by IBM to allow more effective use of the small system as satellite to 370 mainframes operating under OS/VS1 or OS/VS2, or as a host to its own set of terminals.

The remote job entry feature has been extended to support data entry from the S/3 disk as well as from tape and unit record devices as before. Reading from several devices can be concurrent and this ability is reflected in the feature's new name: Multi-leaving RJE Work Station (MRJE/WS).

A Communications Control Program (CCP) has been added as a feature to provide a generalized teleprocessing capability under SCP. Application programs can be written in any S/3-compatible language and, with enough storage, eight tasks can be run concurrently on the S/3/10, or 16 tasks on the S/3/15.

The MRJE/WS disk support allows the user to store application programs as well aa data on the S/3 disk and to transmit both to the 370 mainframe for processing.

After processing at the central CPU, writer output can be directed to card punches, printer, disk or tape at the remote location, or to any of the peripherals of the 370.

MRJE/WS operates under point-to-point communications facilities via the Binary Synchronous Adapter. This updated feature is free to Model 6 or Model 10 users.

CCP encompasses many facilities including security checking and an ability to initialize programs from any terminal. To use the new feature effectively, IBM said the user should have 48K bytes of dedicated storage or 64K of storage in dual programming mode. CCP is free for the S/3/10 now, and for the S/3/15 in September.

Assembler Seen Key to CICS Use

NEW YORK – While users of IBM's Customer Information Control System (CICS) face problems, careful planning – and the use of at least one, newly available support package – can solve some of them, and the forthcoming VS implementation of the system should overcome others, according to a consulting firm specializing in CICS.

At a recent seminar it sponsored for technicians and managers, Computer Horizons Corp. (CHC) identified lack of storage protection as one of the more serious problems.

All tasks in the CICS partition are similar to separate programs in the operating system, CHC project leader Richard Mogilefsky explained, but – unlike separate programs – the Program Status Word (PSW) key is the same for all tasks in the partition. Therefore, any task can destroy any other task or the CICS nucleus, he warned.

Higher-level language programmers should be trained in Assembler concepts since the untrained programmer is more likely to make errors that can cause storage modification outside his or her task. Use of standard-size programs might also help, CHC project leader Robert Koehmel said.

The Dynamic Mapping software package recently announced as a Field Developed Program from IBM (CW, March 6) is "another helpful tool, letting the programmer review core and storage chains during CICS execution," he added.

Core considerations are a major concern, Koehmel went on, because core estimates are often inaccurate. Applications should not be written in a high-level language if the user is operating in any CICS environment where the memory dedicated to CICS is extremely limited.

The reentrant coding interface for each program will require a "substantial percentage" of total space available, he warned. However, "reasonably accurate, yet complex" core estimation formulas may be found in IBM's general information manuals for the particular CICS being used.

Also significant, however, is that core fragmentation can degrade throughput of a CICS task. If a 5K area is needed, CICS will search for contiguous core but core will not be reorganized dynamically to make the needed space available even if there are enough interactive tasks that could be eliminated.

Instead, the new task requiring space not available will wait until the space becomes available.

In this situation, standard-sized task programs would help, and of course paging under VS should eliminate the problem altogether, the seminar was reminded.

Terminal Selection

Terminal response time is sometimes less than satisfactory, Mogilefsky noted, but this is "usually caused" by an improper hardware configuration or inefficient application coding. Terminals should be chosen very carefully, especially if the user expects to move to VS. Support for the IBM 1130 and the 360, and the 2780 and 2260 units, will be dropped under VS, as will backing of TCAM software, he said.

A booklet outlining the "problems" session and all the other presentations made at the seminar is available for $35 from CHC at 747 Third Ave., 10017.

COMMUNICATIONS

Is IBM Software Affected?

Data Link Standards Differ on Numbering Methods

By Ronald A. Frank
Of the CW Staff

WASHINGTON, D.C. – A major difference has been isolated between the data link control procedure now being considered for an industry standard by Ansi and the latest proposal from IBM. The difference centers on the control field numbering, according to industry experts. And it may be causing a delay in first installations of IBM's software.

The standard under study by Ansi is the Advanced Data Communications Control Procedure (ADCCP) while the more recent IBM proposal is the Synchronous Data Link Control (SDLC).

In each proposed standard there are eight bits in the control field but they are used differently.

In the ADCCP version, the control field uses four bits to define the pattern which indicates the response or the command, and the other four bits are a sequence number indicating the number of a frame, according to one standards expert. In this protocol the primary (transmitting) end of the line originates the number and the secondary (receiving) end of the line uses this number as a reference. So, in effect, the primary assigns the system numbering sequence.

In the SDLC or dual numbering proposal, three bits are assigned to the primary end of the line for control, three bits are given to the secondary end of the line, and two bits are used for command and response purposes.

Analysis

The term SDLC is used by IBM but within Ansi standards committees the original protocol is called ADCCP with dependent numbering; and the latest proposal is known as ADCCP with independent numbering.

Much of the original work in developing a bit-oriented data link control was devoted to a single number system. Both U.S. and European standards organizations continued work on this version of ADCCP when IBM first introduced its double numbering or independent numbering proposal in 1971. The single numbering system, or dependent numbering system, is now in its final stages as an Ansi standard although it is difficult to predict how soon a standard will be adopted.

The real question plaguing users, equipment suppliers and standards experts is how the two methods will interact with one another. Very little is known about IBM's intentions in proposing the SDLC protocol at a time when work on the original version was already well along in the Ansi study cycle.

In a statement commenting on the relationship between the dependent and independent schemes, an IBM spokesman said: "In light of the complexity of the subject, one should expect that there will be some technical differences at any point in time. We would hope that the end result would be an appropriately related family of standards."

The standards that are finalized for data link control in data communications systems are obviously important for users who must plan several years ahead. IBM has announced several terminal-oriented systems that will use SDLC. It is assumed this will be the independent numbering protocol the company has proposed.

One of the first implementations of SDLC was scheduled for the first quarter of this year. This would have been a software module of IBM's Virtual Telecommunications Access Method (Vtam) to allow 3704/3705 front-end processors to communicate with each other or with a virtual storage 370 mainframe, using SDLC.

But IBM has announced that first customer installations using this Vtam module for 370X SDLC transmissions have been delayed until the fourth quarter of this year. An IBM spokesman said the delay was necessary "to provide additional time for testing and performance optimization and to begin synchronize with support of the new IBM SDLC."

Establishment of data link standards will be an important step toward the compatibility of communications networks of the future, according to one standards expert. Until the link control procedures are finalized, it will not be possible to begin work on standards to interconnect separate networks, he pointed out.

Front End Handles University's Terminal Mix

By Patrick Ward
Of the CW Staff

KINGSTON, R.I. – The University of Rhode Island here is using a variety of terminal equipment to suit the needs of its various departments.

Included in the university's inventory are 48 IBM 2741s, six ITT 3501 Ascicscope video displays, two Harris Communications (Datel) Cope 1030s, one Model 33 ASR teletypewriter, two Memorex 1240 keyboard/printing terminals, one Portacom terminal and two Cope 1200 RJEs.

Transmission rates vary from 100- to 1,200 bit/sec. Ascii, Ebcdic and BCD codes are used.

The university's IM-byte IBM 370/155 controls the concurrent time-sharing and batch operations through a Memorex 1270 communications controller.

The controller's ability to translate various communications codes and speeds allows the user departments to select the terminals they want, according to Dr. Nelson Weiderman, director of the University Computer Laboratories.

Within the CPU, input from the diverse equipment looks like it originated from either a 2741 or a teletypewriter with a full Ascii keyboard, said George Little, assistant director of the laboratory.

The 370's Call-OS Time Sharing System had supported 64 key teletypewriters, but it was reprogrammed to accept full Ascii.

The 1270's automatic speed (autospeed) recognition allows a terminal to send an identifying character which selects the speed and the terminal control, Little noted.

"So if it looks like a 2741, the identifying character selects the hardware control for a 2741. If its looks like an Ascii device, the hardware selects the Ascii controller" and also the speed, Little stated.

The Call-OS system has been able to handle the faster devices without problems so far, Little said, though he mentioned that other users had found this a problem.

The university has a DEC PDP-9 used in data transfer from a graphics application and also occasionally as a remote job entry unit transmitting at 1,200 bit/sec.

"They have I/O handlers in the PDP-9 to control the line and the standard I/O packages . . ." Little said. "By the time it gets on the line it looks like a time-sharing terminal," he added.

Heavy Research

The computer laboratory supports both university research projects and instructional programs about equally in terms of individual jobs. Research work, however, consumes about seven times as much CPU time as educational use.

Terminals are located on campus at Kingston, in the Graduate School of Oceanography at Narragansett, at the university extension campus at Providence and at several high schools.

The 1270 controller provides 96 lines of communications capacity and was installed in March 1973 when the computer laboratory outgrew the 32-line capacity of IBM 2702 controller.

"It was time to go to bisynch communications, and it was time to go to more 2741 terminals," Little said.

"We didn't select the 1270 because we wanted to go to these weird terminals, it was kind of a fallout," Little remarked.

Autospeed was the factor that "made us immune to subsequent IBM proposals to replace the 1270 with a front end."

Other vendors offer autospeed on their front ends, but the 1270 is price-competitive, Little added.

AT&T Files 209 Data Set Rates With Multiplexing, Conditioning

WASHINGTON, D.C. – AT&T has filed proposed interstate private-line rates for its 209 data set with the Federal Communications Commission. The 9,600 bit/sec modem will be the first from the Bell System to offer users a multiplexing capability.

The basic rate for the 209 is proposed as $230/mo with a $200 one-time charge for installation. This will include a new level of line conditioning for 3002 lines described as "high-performance data conditioning." This conditioning will be designated as D-1, according to an AT&T spokesman, and it will not be compatible with voice usage of the line.

In addition to the basic rates for the 209, a user who selects the multiplexing capability will have to pay monthly line charges and an installation fee depending on data speed and location of the terminal and/or CPU, the spokesman said.

For "remote terminal interfaces" which are not hardwired but are in the same building, the additional costs for 2,400 bit/sec will be $115/mo with $150 installation. For 4,800 bit/sec this charge will be $255/mo and $250 installation.

For interfaces not in the same premises, the cost at 2,400 bit/sec will be $135/mo and $150 installation and at 4,800 bit/sec the charges will be $275/mo and $250 installation.

Set for March 25

The added charges will apply to each data stream at the appropriate transmission speed. The 209 will be compatible with 2,400 bit/sec data streams from the Bell 201, and with 4,800 bit/sec data streams from the Bell 208 data set. The proposed rates are scheduled to take effect March 25 unless suspended by the FCC.

Assuming approval of the rates, first installations could begin by the end of March, the spokesman said. A prototype installation of the 209 has been operating at a General Electric facility in Schenectady, N.Y., where two 209s were installed between CPUs about 100 feet apart, the spokesman said.

CDC Remote Batch Terminal Supports Cyber, Some IBM CPUs

MINNEAPOLIS – Control Data Corp. has a remote batch data processing terminal with a flexible configuration and dual protocol options to support CDC Cyber 70, 6000 and 3000 Series systems. In addition to emulating the IBM 2780 batch terminal, an optional version can interface with IBM CPUs that support the 2780.

The terminal, designated as either the CDC 734 or the CDC 27801 depending on protocol, extends the resources of a central computer complex to remote locations.

The terminal combines the capabilities of CDC's 731 Low Speed Batch and 732 Medium Speed Batch into one device. Optional protocol is available for either the CDC 200 User Terminal emulation or the IBM 2780 emulation. Either is installed by the operator using the card reader.

The basic configuration of the 734 includes a 734-1 modular terminal controller with 16K 8-bit bytes of memory, adapter logic for the card reader/printer, a synchronous communication line adapter, operator panel, keyboard/display and 200 User Terminal emulation controlware. The user has a choice of two card readers and two line printers.

The CDC 734 batch terminals are now available, CDC said. Purchase price for a typical configuration consisting of modular terminal controller, low-speed card reader and low-speed printer is under $27,000. One-year lease price for the same configuration is approximately $750/mo, excluding maintenance.

2780 Controlware

The 27801-10 controller has 16K 8-bit bytes of memory and includes adapter logic for the card reader/printer, cyclic encoder, synchronous communication line adapter, operator panel, keyboard/display and controlware for IBM 2780 emulation. The user has a choice of either a 300 or 600 card/min card reader, and one of three line printers.

First deliveries of the 27801 Batch Terminal are scheduled this month.

Purchase price for a typical configuration, including low-speed card reader and printer, is approximately $25,900. The commercial term plan lease price for the same configuration is $515/mo, excluding maintenance.

Low-Speed Coupler Ready

FORT WASHINGTON, Pa. – An acoustic coupler with -50 decibel/min sensitivity has been announced by Tele-Dynamics.

The Model 7102AD is portable and may be used for low-speed data transmission with a variety of terminals and telephones. The unit is available as originate-only, answer-only or originate/answer and provides simultaneous TTY and EIA (RS 232) output as well as terminations for direct tie-in to a Bell Data Access Arrangement.

Prices start at $292 from Tele-Dynamics, Division of Ambac, 525 Virginia Drive, 19034.

A Look Toward 1985—Part III

Nets Locked In; Change Could Be 'Catastrophic'

By Vic Farmer
Of the CW Staff

CAMBRIDGE, Mass. – The computer user, after he has installed one of the fourth-generation computer systems to be available during the next 10 years, will find he will no longer be able to distinguish his individual computer components clearly by either boundary or size.

This is one conclusion of a DP technology assessment Arthur D. Little, Inc. (ADL) conducted for the U.S. Air Force recently.

By 1985 the user will have many modules – some collected into DP centers and some geographically dispersed – but all modules will be interconnected, ADL predicted. The users will no longer be able to replace the entire network without a "catastrophic upheaval."

But "it should be easy to replace or add a module, as long as it is compatible with the system software, which is completely responsible for the user's interaction with the machines and which has become the computer industry's most important product."

The study defined three system architectures: the central system which can be connected to either the hierarchical network or the loop network for real-time, on-line processing. (Figures 1, 2 and 3)

The central system will be based on memory access because the virtual high-speed memory and its backing store – reached through the file controller – are logically integral. The memory will include several separately powered banks, so the system can operate even if there is a partial failure.

Added Insurance

The virtual logic and the backing store will insure against loss of content. Input and output of all kinds will move between the memory and multiplexed controllers causing appropriate interrupts.

"I/O controllers dealing with batch peripherals are logically different from those handling the communications network, but they can probably exchange functions through changes of stored logic, thereby adapting to varying I/O loads," according to ADL.

Two or more CPUs will work asynchronously to process the jobs in the single stream resident in memory, and when an interrupt occurs, the first CPU free calls the necessary operation system routines and tables, and, if necessary, reschedules the job stream.

A hierarchy of file storage devices will connect to the memory through multiple controllers, and these controllers will conduct most file maintenance, automatically managing the devices in a virtual mode.

Communications Networks

Connected to this general computer system will be large and complex communications networks of either the hierarchical or loop structure.

The hierarchical structures will be used when the applications involve interaction with a single set of central files, and terminals will connect into the system with data concentrators to reduce line costs. "The terminals themselves are likely to have internal processing capability for editing of internal data, assisting operators in following procedures correctly, and generally performing whatever operations on the data that can conveniently be done locally with access to the central data base," according to ADL.

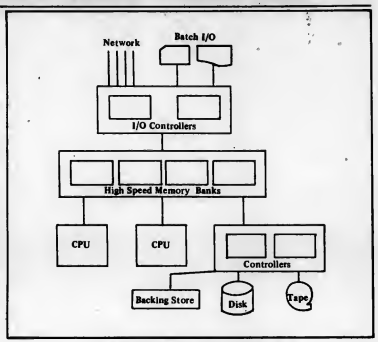

Figure 1. Fourth-Generation Central System

Satellite processors with file-handling capability will, moreover, handle applications in which the records are only needed locally, such as local payroll and inventories. Even though such a satellite will be tied up on local processing, it will provide data for the central system.

Where use of a central file is not needed, interconnection will still be needed in the interest of sharing computational workloads and exchanging the smaller amounts of data and can be accomplished through a loop network.

Loop Networks

These networks usually operate on the basis of transmitting fairly large packets of data, both for economy and because most information systems still produce data primarily on a batch basis.

"Often programs to process the data are part of the packets, and some have suggested that as the cost of wideband transmissions drops, portions of files may also be interchanged. A minicomputer is employed at each node of the loop as a store-and-forward device for packets being transmitted.

The mini can have a file storage capability for temporary retention of packets passing through, but this is small compared with that of the local central computer to which it is connected, according to ADL.

Hybridizing of both the hierarchical and loop architectures is practical and may involve, for example, connecting a group of terminals to a concentrator attached to a node in the loop.

Part IV will delve into a forecast of computer memory technology and processor technology as seen in a recent Mitre Corp. study.

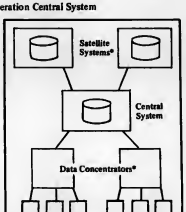

Figure 2. Hierarchical Network

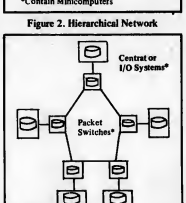

Figure 3. Loop Network

Bits & Pieces

IBM 1403 Linked to PDP-10

SANTA MONICA, Calif. – A controller that permits the IBM 1403 printer to be operated by DEC PDP-10 computers has been introduced by Spur Products Corp.

DEC offers three different printers that will operate from its own computer. These can print either 64-, 96- or 128M characters. The Spur controller makes it possible for all three of these character sets, as well as any other print train including custom-designed fonts, to be interchanged on a single 1403 printer. No program changes to the DEC operating system are required in order to use the Spur controller.

The controller includes all logic cards, memories, mating connectors, power supplies and instructions for operating, programming and maintenance.

The $1403/PDP-10 controller sells for $17,000. Spur is at 2928 Santa Monica Blvd., 90404.

UPS Offers 1,800 W of Backup

SAN DIEGO – The DSU-1810 uninterruptible power system from Deltec Corp. offers 1,800 W of backup power.

The DSU is a self-contained system including battery charger, battery reservoir and output inverter-regulator.

Standard accessories are alarm indicators and remote signals for loss of utility ac and battery low, ac current and voltage output meters and reverse transfer switch which automatically switches the critical load to utility power should an unexpected failure occur in the system.

Price of the DSU-1810 is $2,995.

Deltec is at 3849 Gaines St., 92110.

Bits & Pieces

Floppy Disk Interfaces Most Minis

SUNNYVALE, Calif. – A floppy disk system from Xebec Systems, Inc., with a universal formatter can be used with almost any minicomputer, such as those of Modular Computer Corporation, Datacraft and all of the Interdata 70 Series.

The XFD-100/U flexible disk system includes a disk assembly with one or two disk drives, a formatter and about one half of the coupler hardware that interfaces the formatter with the selected minicomputer. The other half of the coupler can be supplied by Xebec or can easily be built by the end user using the instructions and documentation supplied with the XFD-100/U, according to the firm.

Price of the XFD-100/U is $3,350 with a single disk drive or $4,400 with two disk drives.

General specifications of the XFD-100/U are: disk capacity of 256K byte; 64 tracks; 32 sectors; 375 rpm rotational speed; 10 msec track-to-track access; and 31 kbyte/sec transfer rate.

Xebec is at 566 San Xavier Ave., 94086.

DEC 'Standard 8' a Turnkey Mini System

MAYNARD, Mass. – A turnkey minicomputer system, built around the PDP-8/E minicomputer, has been announced by DEC. The system employs both disk and cassette storage peripherals, OS/8 software, and costs approximately the same as the first PDP-8 in its minimum configuration when it was introduced in 1965, according to the company.

The standard 8 system is priced at $18,000 – a 13% savings over equivalent configurations previously available, DEC said.

The standard 8 system is composed of a PDP-8/E with 8K of core memory, a moving-head disk and a dual-drive DEC cassette, all mounted in one cabinet, plus a Decwriter terminal, and software consisting of DEC's OS/8 system and diagnostics. (The first PDP-8 in its minimum configuration consisted of the processor with 4K of core and a teletypewriter.)

Dual Floppy Disk Drive Stores 4.4M Bits

DENVER – Dynastor's Model 40 dual floppy disk drive has storage to 4.4M bits, data transfer rate of 2.54M bit/sec, average access time of 210 msec and has a copy capability from one disk drive to the other. A mini controller, called FAD by Dynastor, is optional.

Dynastor's disk drives utilize a noncontact mylar disk, preformatted and certified, with track-following servo information not available with IBM-compatible contact recording disk memories, according to the company.

The dual drives are priced at $1,100 ($6.50 for a disk cartridge). Dynastor is at 5867 N. Broadway, 80216.

BASF Enters Floppy Land With 'Flexidisk'

BEDFORD, Mass. – BASF has priced its entry into the floppy disk media at $8 each. Each Flexydisk is coated on both sides "in the event that current disk drive equipment is upgraded for dual-side use." The diskettes are initialized for use on IBM 3740-type drives. The company is on Crosby Drive, 01730.

The Graham Vow.

The Graham Vow expresses Graham Magnetics' pledge at a time when much of the computer tape industry strives for lower production cost through shortcut processing and testing.

- Graham has maintained and will enhance its program for increased excellence of product and high standards of Quality Assurance.
- Graham will take *no* shortcuts in manufacturing and testing of tape.
- Graham will *not* relax the stringent inspections and 100% certification which every reel of tape must pass before shipment.
- Graham will *not* delude you by compromising quality. On the contrary, Graham will enact even more exacting standards with the continuing development of new precision methods and techniques.

GRAHAM
MAGNETICS

Performance Measuring or 'How Is My System Loaded'

By Patrick Ward
Of the CW Staff

CINCINNATI – Performance measurement boils down to the question, "How is my system loaded?", Ray Hitti, director of hardware and software evaluation for Sohio, told a Computer Caravan forum on performance measurement.

DP installations can't use hardware or software monitors effectively if they can't describe their loads and the resources they use based on the commitments they have. "The only way to truly understand what you are doing is to model your workload," Hitti said.

The two 370/158s at Sohio's central installation run under the ASP operating system, Hitti said, and the staff wrote a simulator in Fortran for it over a period of a year and a half.

The simulator is job-oriented and is used in case studies to account for the way memory and I/O are utilized, Hitti added.

What Commitments?

The DP manager should go down through the list and ask what commitments have been made to the users on each of these jobs. These commitments might be issue times or turnaround times, he said.

Hitti defined a committed issue time as an agreement between a DP manager and his user that "if you bring in data at 9:00 I'll have results at 11:00."

Promised response times for real-time users would be another form of commitment, Hitti added.

"Any DP manager," he said, "should at least have a mechanical or manual log to verify whether you have met your user commitments and how your resources have been used in fulfilling your commitments."

A rudimentary way of doing this, he said, is with a "slack ratio" equal to committed turnaround divided by processing time.

Turnaround time is equal to the committed completion time minus arrival time. Arrival time is when the job package is complete and ready for processing.

Processing time is equal to run time plus setup, plus staging, plus library fetch, plus printing, plus decollating time, Hitti said.

Any value of the slack ratio beyond 1 measures "breathing room," Hitti explained, while a value of one means you have a full or "dedicated" system with no room for slack.

At Sohio, Hitti said he prefers a slack ratio above one to accommodate users who are late with data.

The slack ratio is a "business-like tool" that users and executives can understand, Hitti pointed out.

"Using this tool helps identify how much capacity remains," he said. "Now you can cite empty resources and when you're filled, and by whom and at what level of commitment."

It also can help with commitments that are no longer valid. In his own firm, "users were less upset by revised times than by missed commitments."

Color's the Key

At his own installation, Hitti stated, there is a board, updated daily, that lists the most important commitments of the shop. The board either stays green or turns red depending on how well the shop is doing. And, Hitti said, "the DP manager's raises are based on how red or green the board gets."

The board serves as a communicator to the entire staff as to how well we're performing," he added.

"Under no circumstances – whether batch, real-time or both at once – can you have very high levels of utilization without hurting response time or turnaround time," he noted.

Where Are We?

Asked to describe a plan for measurement, Hitti advised DP managers to know what level of utilization they are at; to know whether they have properly used that resource (the utilization rate alone won't say); and to know what capacity is left.

But the user must understand enough about his workload to know what kind of work can be added on, he remarked.

Operating Procedures Of DP Room a Key To Overall Security

TORONTO, Ont. – A simple way to determine the security of your computer system is to check it against the following "musts" concerning computer room operating procedures:

- Consider using special printers or output terminals to handle the printing of sensitive data, such as salary data or market forecasts, and consider having a representative of the user department and the computer room shift supervisor present.
- Supervise computer operations at all times to ensure that no operator can use your computer equipment and time to run jobs for outsiders without your knowledge.
- Establish procedures for preauthorization of all overtime use of the computer equipment, programs, tapes and disks.
- Ensure there are operating instructions for every job in the computer center, that they are properly updated when changes are made, and that they are frequently reviewed by the shift supervisor to ensure that standards are being maintained.
- Clearly document rerun procedures for each system to reduce the possibility of operator error.
- Schedule all computer processing for operational systems to reduce peak workloads and thereby reduce the risk of operator error.
- Delegate to a production scheduler or controller the responsibility for dispatching jobs to the computer room, recording which equipment is used, what time the job is submitted and what time it is completed, and for following up data not yet received when a job is scheduled.
- Record the progress of jobs through the computer room on a run control log showing estimated versus actual times, reruns, errors, restarts and interruptions.
- Ensure that all systems provide a set of standard messages and instructions to the operator under various conditions, thereby reducing the requirement for the operator to make decisions.
- Establish procedures to protect the computer during off-shift hours, such as: locking computer room doors, having security guards check all cabinets and doors to make sure they are locked, giving guards a list of authorized off-shift personnel, keeping a log of off-shift computer users, recording meter readings before and after off-shift hours.

This checklist was compiled by DCF Systems Ltd., 74 Victoria St., Toronto, Ontario M5C 2A5..

Law Enforcement Conferences Spice April Offerings

Taking the Measure of Crime

LEXINGTON, Ky. – Technological developments as applied to law enforcement, security and crime prevention will form the basis of sessions at the 1974 Carnahan and International Crime Countermeasures Conference, April 16-19, at the University of Kentucky's Carnahan House.

Sessions will cover research and development of advanced sensor techniques, standards for law enforcement equipment, police systems and automatic vehicle monitoring.

Papers scheduled for presentation during an electronic data processing session include "Design and Application Considerations for Obtaining RF-technical Secure Areas"; "EDP Security through Positive Personal Identification"; and "Research and Development of Personal Identity Verification Systems."

Several papers by authorities from the UK will be presented, including "Experimental Technical Support Unit for the Police at Durham, England," and "Perimeter Intruder Detection System of Microwave Energy."

Registration for the Conference is $150. Further details are available from John S. Jackson, Department of Electrical Engineering, University of Kentucky, 40506.

Safeguarding Privacy

SAN FRANCISCO – "Law Enforcement Information Systems Management" will be the subject of a two-day workshop, sponsored by Continuing Education in Engineering and the College of Engineering, University of California, Berkeley.

Topics at the April 26-27 workshop will include experiences in implementing privacy and security controls; administrative and technical security measures taken in a large state law enforcement computer center; problems and prospects of national telecommunications networks and mobile computer terminals; specifications and guidelines in selecting equipment.

Use of outside contractors, legislation and policy trends and advanced computer applications will also be considered.

Featured speakers include Robert Gallati, former head of the New York State Identification and Intelligence System; Col. James Newman of the Kansas City (Mo.) Police Department; and William Herrmann of the Law Enforcement Assistance Administration.

Registration for the conference is $150. Further information is available from Continuing Education in Engineering, University of California, 2223 Fulton St., Berkeley, Calif. 94720.

World Symposium Set

SAN FRANCISCO – The second International Symposium on Criminal Justice Information and Statistics Systems, sponsored by Project Search and the Law Enforcement Assistance Administration, will be conducted April 30-May 2 at the Hotel St. Francis here.

Over 60 papers will be delivered on systems design, applications and evaluation.

Some papers include "The Role of Computers in Developing an Innovative Approach to a Comprehensive Information System for Juveniles," "Contemporary Automation in the Courts;" and "A Binary Approach to Criminal Justice Reporting Systems."

Preliminary plans for the symposium include an address by Attorney General William Saxbe.

Further information is available from Thadd McNamara, California Crime Technological Research Foundation, 7171 Bowling Drive, Suite 190, Sacramento, Calif. 95823.

Computer Week IV Probes Social Issues

BUFFALO, N.Y. – For those weighing the social issues surrounding computers with the practical problem of efficiency, Computer Week IV will be held May 20-24 at the Statler Hilton.

The week-long informational campaign will tackle such questions as: "Do computers threaten our privacy and depersonalize our business, as some people claim, or are they the servants that will help us toward a better way of life?"

Hardware displays, lectures, seminars and tours will try to answer such questions for the general public as well as computer professionals and users.

The week will include a dinner followed by an award to a person who has contributed substantially to the industry.

Sponsors of Computer Week are the Association for Systems Management; the Association for Computing Machinery; the Data Processing Management Association; and the Institute of Management Sciences.

Societies/ User Groups

Societies Sundries

C. Gordon Bell, professor of computer science and electrical engineering (now on leave to Digital Equipment Corp.), Carnegie-Mellon University (CMU), has been cited by IEEE for "contributions to the design of time-sharing computer systems and for education in the understanding of computer structures."

Allen Newell, university professor at CMU, was cited "for contributions in computing through list-processing language development, and for texts on computers, digital systems and artificial intelligence.

Both men have been named IEEE Fellows.

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Vaughn G. Alexander of the American Medical Association has been elected to the board of directors of the Society for Computer Medicine.

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Thomas Carr, St. Vincent Hospital, Worcester, Mass., has been named president-elect of the Hospital Information Systems Sharing Group.

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Computers in Information Data Centers, a compilation of 10 papers presented at the 1972 Fall Joint Computer Conference, is now available for $10 from Afips Press, 210 Summit Ave., Montvale, N.J. 07645.

Don't wait till the last minute. Now's the time to make sure your schedule includes a visit to the computer show that has already benefited more than 40,000 computer users in its first two years. Here are some of the details of our updated '74 program.

THE FORUMS user-to-user in '74

The Computer Users' Forums give you a unique opportunity to exchange information with other users and independent experts about current practical problems. Forums run from 9:00 A.M. to 2:30 P.M. each day, including an opening report, panel discussions, morning and afternoon workshops and luncheon. If you register in advance for the User-to-User Forums, *you'll save $5 per day* from the price at the door. If you attend all three days, *you'll save $15*, just for acting early. (Note that no advance registration is required if you attend the Exposition only).

Here are the Forum topics for '74

First Day — **Source Data Automation Today**
with workshops on
Point-of-sale, Intelligent Terminals,
Optical Scanning and Off-Line Key Entry

Second Day — **Data Communications Update**
with workshops on
Network Planning, Front-End Processors,
On-Line Systems and Equipment Selection

Third Day — **Operations Management**
with workshops on
Performance Measurement, Project Control,
Multi-Vendor Installations and Small Centers

Free afternoon sessions

Each day an important, current topic is discussed in an open afternoon session at 2:45 P.M. – free to all Caravan attendees. In 1974 we'll be looking at:

FIRST DAY – Personnel
SECOND DAY – Data Communications
THIRD DAY – Data Base Design

The Computer Caravan/'74 sponsored by **COMPUTERWORLD**

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From 10 A.M. to 6 P.M. each day, you'll have a unique chance to see and compare the latest EDP equipment and services in a pleasant, uncrowded exhibit hall. You'll see everything from complete systems, to independent peripherals, to software to terminals. And you'll be able to talk specifics about your problems and needs with knowledgeable representatives of leading EDP companies. Because The Caravan has a total of 30 show days in ten cities, no one day is too crowded. The whole Exposition is designed to let you get the facts you want from the people you want to see. And the people you want to see will be there. Here's a partial list of the companies that we'll be keeping on our '74 tour:

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A Mini Stands Among Giants

By Robert L. Glass
Special to Computerworld

CENTRALIA, Wash. – In the middle of a pristine Pacific Northwest forest, where the only noise for miles around used to be the wind caressing the fir trees, sits a computer.

A Data General Nova 1200 is housed in a protective shed complete with its own power source. Its task? On-line monitoring . . . of tree growth!

Weyerhaeuser Co. is responsible for this odd-sounding, odder-looking application.

If tree farming ever is really going to be farming – and not just seeding and harvesting – then there is much more to be learned about making trees grow.

So says Dr. Jim Woodman of Weyerhaeuser's Forestry Research Center here, who is responsible for the installation and the research program it supports. And to back his position, he cites the following points his project has established:

- Trees grow seasonally. The trees in his test plot obtained all their growth in March through September, none the rest of the year.
- The height growth season is different than the circumference growth season.
- Trees shrink as well as grow. The test trees shrank during the day, grew at night; and they shrank for weeks at a time during droughts.
- Fertilization, irrigation and thinning can more than double tree yields.

That last point really is the crux of the project, Woodman feels. What combination of growth enhancement factors can most effectively and economically give increased yields?

Answering that question involved turning a forest into an electronic technician's nightmare. Ten miles of wire link the growth-measuring devices attached to the trees from the computer which patiently records their readings.

Bands to measure lateral growth surround the trees. Solar receptacles measure sunshine. Other devices measure air and soil temperature, relative humidity and wind speed. Woodman calls these factors a tree's "micro-climate."

The bulk data accumulated in the field is taken to Weyerhaeuser's central computing facility for "data reduction." Some data can be obtained on-line, however, through the computer's console teletypewriter. Have there been any malfunctions? When? (A normally graceful deer can wreak havoc on a field experiment if it steps in the wrong place.) What are the current device readings? Growth rates?

But why put a computer in the woods? Speed and accuracy, low operating costs (vs. manual methods), highly usable data (90% is typical; 70% used to be excellent); timing information; and the previously mentioned, and important, malfunction detection – these more than make up for the high initial cost of the computer, and its attendant shelter and power supply problems, Woodman says.

Install Hooks to Catch Openings in Data Files

DP security is a complex, interactive mix of physical, procedural and data protection, with a healthy amount of backup and audit.

This series gives an overall look at the security responsibilities of users and vendors, defines the threats to security and analyzes in detail protective measures to minimize security risks.

(End of Series)

One major problem in data security authorization is achieving the proper results from a privacy decision. There are really four possibilities. One can either allow access or deny it. Two results are proper, two of them wrong.

A good authorization system will reduce or eliminate the chances for successful invasion or the improper rebuff of a normally authorized person or subject.

One can make several choices. Access can be allowed or denied to an entire data base, to certain files, to certain records or to data elements. Distinctions can be made between privileges. For example, the system can allow read, read or write, execute only or perhaps write only.

The next question is what to identify. Should identification be limited to people or to terminals, programs or data sets?

The authorization control problem has economic ramifications. The authorization data base needs to be built into the computer. In a large system, with innumerable data sets, personnel, programs and remote entry devices, it becomes an administrative nightmare to lay out various authorization combinations.

The authorization possibilities are normally stored in what has been called an access matrix. In large systems this access matrix is sparse and immense. This leads to the interesting possibility of requiring an authorization computer many times larger than the computer that is supposed to do the processing.

Assuming selective authorization is a desirable property, how would one go about it in the absence of facilities provided by the vendor? One approach is to install hooks into the existing operating system to trap openings of data files. It is a relatively simple procedure to write code that analyses certain data for read or write privileges by certain people, jobs or programs. This could be on a selective basis, so the overhead is kept at a minimum.

In addition, it is possible to trap and collect statistics on use of data. IBM's SMF (System Measurement Facility) can be used to develop reports on a current basis that print out usage of important or sensitive data by job name, user name, accounting parameter field, date, time and other parameters.

There are numerous procedural mechanisms one can install to help limit use and access of data. The first is that of change control. Whenever a data format is changed, a program is altered, a system configuration is changed or new processes are developed, it is essential that such changes are documented, and its use regarding adequacy of controls, levels of risks, exposures and compliance with defined standards and procedures.

Even though there is a possibility of some loss of independence, it is a good idea to get computer security specialists involved with the audit function in the development of audit plans, review of the security programs and in the actual audit.

Peter Browne is manager of the security operation, General Electric, Information Services Division, Bethesda, Md.

		SUBJECTS			OBJECTS FILES		DEVICES	
		S1	S2	S3	F1	F2	D1	D2
S	Browne			Execute	Read			Use
U	Accounting Dept.				Write	Read		
J	Smith	Stop				Update		
E	Job 1234			Create		Delete	Use	
C	Program A		Wake up		Read Write			Not Use
T	Jones							

Example of Access Matrix

Part VIII Access & Audit

authorized by appropriate management and controlled closely.

No device, terminal, program, data set or file should have the same name. If this principle is rigidly followed, change control procedures appropriate to any installation can be easily installed and monitored.

A viable data processing standards program, an organizationally distinct quality control unit, and a central point for the placing of well-tested production programs on the system will do wonders for security and control.

Audit of data processing is achieving high visibility. The results of either internal or external DP audits can be used to define and plug security loopholes in the system.

Recurring security audits should be accomplished periodically. Such audits would look at the entire information system

Atom Smasher Controlled

CHICAGO – One of the world's largest scientific instruments – the National Accelerator Laboratory's 300-billion-electron-volt proton synchrotron – is now being controlled by four computers.

In the synchrotron "atom smasher," protons are accelerated to their final energy in three stages using a 500-foot-long linear accelerator, a circular booster accelerator and a main accelerator four miles in circumference.

Each of the three stages is controlled by a Xerox 530 computer with 48K words of memory. The fourth unit serves as backup.

'Oh My Yes – We're Security Conscious Here'

IBM Scientist Forecasts

Future 'Peripherals' to Be Integrated Into CPU

By E. Drake Lundell Jr.
Of the CW Staff

SAN FRANCISCO – Peripherals as they are known today are definitely on their way out. In the future, peripheral equipment will be integrated into mainframes as terminal devices in the field assume more intelligence.

That was the word from IBM's chief scientist Lewis M. Branscomb speaking at the recent Compcon '74 meeting here of the IEEE Computer Society.

"Today's machine room subsystems that can be functionally integrated into the central storage and processing system will become transparent to the user and . . . no longer 'peripherals,'" he predicted.

In addition, "hardware-controlled storage hierarchies will strongly influence system architecture thinking," he noted.

"Specifically, system structures which take these matters into account will move traditional peripheral wheelhorses such as strips, drums, disks and tapes out of the planetary coupling mode of classic computer structures into the nucleus of the data handling system," he added.

Branscomb also pushed the magnetic bubble memory idea as "an example of new technology with promise for the future.

"The [bubble] technology offers a wide range of possible device configurations, with the potential of sustained future improvements in device properties," he said, adding that the first encroachment by bubbles on the traditional disk market should occur in the small file area.

Can Data Entry Keep Up?

The increasing amount of digital storage capabilities in future systems, however, raises the question of "whether data entry can keep up with the voracious appetite of storage," Branscomb said.

"This issue is particularly important since data entry represents an increasing fraction of data processing costs, as computers are increasingly applied to the management of large data bases and information systems," he said.

Because of this, he said, future data entry systems will rely less on keystroking and will turn more to scanning devices and possibly even speech recognition in limited application areas.

"Another highly important area of data entry," he added, "involves sensor-based systems. Just as we now have terminals serving as one man/machine interface, there will be an increasing number of 'terminals' designed as an interface between the computer system and the physical world, with various hybrids in between (e.g., a cash-dispensing banking terminal)."

In the printing area, "non-impact technologies will play an increasingly important role," he said, noting that the matrix approach to printing offers several distinct advantages over other approaches under consideration.

GSA Lets RFPs on $200 Million Project

By a CW Staff Writer

WASHINGTON, D.C. – What may be the largest non-military buy of computer equipment in the U.S. is now under way.

The General Services Administration, along with the Department of Agriculture, has released a request for proposals (RFP) on a major consolidation project that could ultimately carry a price tag of $200 million.

Under the program, the GSA will replace about 45 computer centers run by the Agriculture Department with four new centers and will consolidate 12 GSA regional centers into one center.

The system to be developed would include a packet-switched data communications network to link the centers with each other and with a wide range of terminal equipment in field locations.

The proposal also holds out the possibility that the government would eventually purchase four additional centers from the same vendor for the project.

In addition to the centralization, the project will also include a good deal of standardization, since the software and systems at each of the sites will have to be common even though individual sites might require additional specialized software.

Should Last 8 Years

The systems to be proposed – and which the government hopes to have installed by the end of 1975 – should have an eight-year life, the RFP said, with a maximum of two augmentations.

The proposal – which has been sent to 10 firms – said each site under the proposed contract would consist of a minimum of two central processing units; immediate access storage with a capacity from six to 20 billion characters; from 28 to 36 tape transports; other peripherals such as card readers, punches, printers and display consoles; and at least one remote batch terminal and 10 interactive terminals for each site.

Other terminals that will be needed to complete the entire data communications network will be acquired under a separate buy, the RFP said.

Each of the sites in the proposed procurement would have software support including an operating system "capable of supporting the (site) resources and application requirements of both remote and local batch processing, transaction processing for activity against large data base files, and interactive/conversational processing between terminals and the computer center."

The transaction processor should have system interfaces to include the operating systems, the communications system, the data base management system and the standard batch processing job scheduling software. In addition, it should have control routines for input transaction validation, application program scheduling, statistical recording and reaction to error conditions, the request said.

Data Base System

The system will also include a data management software package consisting of a data base management system, a transaction processor file management system and a standard file management system, the RFP said.

Other software will include language processors, including Fortran, Cobol, Basic, an assembler or equivalent; utility programs and routines; and a management data system to keep track of statistics of operation at each center and over the data communications network.

The communications network will include 16 regional concentrators, eight switching concentrators, a network control center to support several thousand terminals "operating . . . throughout the U.S.," and two processors interfacing with the message switching centers.

Multinational Nets Not Yet Worth Cost?

HILTON HEAD, S.C. – Multinational computer networks within corporations are technically feasible but not yet widely cost-justifiable, according to a study by the Diebold Research Program.

The international common carriers have the facilities in most parts of the world to permit linkage at low and medium speeds, but high-speed facilities are presently rare, the study showed.

The development of true computer-to-computer links on a multinational basis is only within the realm of a handful of corporations, whereas inquiry systems operating in a master/slave mode are more common, according to the report.

CI Notes

Burroughs Nets Swift Award

DETROIT – Burroughs Corp. has received an order from the Society for Worldwide Interbank Financial Telecommunications (Swift) for equipment valued at over $6 million to be used in a new international telecommunications network.

Burroughs will supply two dual processor B3700s, four data communications processors and 14 data concentrators.

The Society was organized to provide its 246-member banks with a private system for transmitting payments and other international banking messages.

Ampex Realigns Divisions

REDWOOD CITY, Calif. – Ampex Corp. has divided the tape and disk operations from the core and semiconductor operations, with the creation of two new divisions.

The new divisions, which reflect a "new corporate directional alignment," are the Memory Products Division and the Data Products Division, replacing the instrumentation and computer products divisions.

The core and semiconductor operation will be handled by the Memory Products Division, while tape and disk fall under the Data Products Division.

Informatics OKs Merger

CANOGA PARK, Calif. – Informatics, Inc. shareholders have approved the merger of Equitable Computer Corp. with Informatics. Upon completion, Informatics will become an indirect subsidiary of The Equitable Life Assurance Society of the U.S.

Supershorts

Honeywell has topped the $1 billion mark in orders for its Series 6000 equipment.

– – –

Hazeltine Corp. has installed its 10,000th Hazeltine 2000 video display terminal.

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For contest buffs – win a tour of the Interdata plant or $1,000 for the best ad idea for the company's Model 7/32 minicomputer.

– – –

NCR has opened an automated service parts center in Peachtree City, Ga. The plant is designed to facilitate delivery of parts around the world within eight hours of receipt of order.

– – –

Univac has begun marketing direct in Puerto Rico with the acquisition of its distributor, Casa Lee Computers, Inc.

– – –

National Semiconductor Corp. has formed a memory systems group to design, test and build custom semiconductor memories.

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Centralized Programming Grows

Stronger Software Industry Seen

By Marvin Smalheiser
CW West Coast Bureau

CANOGA PARK, Calif. – "Software growth will outpace hardware growth."

During the past 25 years, the biggest change has been in the move from machine language to higher and higher levels of language.

"In the future, higher levels of language mean going farther and farther away from the inside workings of the computer.

"Eventually, most of the people using computers will not even know a computer is there."

That's how John A. Postley, beginning his second 25 years in the computer industry, sees the situation from his vantage point as president of Informatics, Inc. Mark IV Systems Co.

Postley thinks the industry will continue to grow "at a good pace" in the next 25 years, although not at the pace of the 1960s.

The costs for software will follow a downward trend on a per job basis, he said.

"I'd like to see someday when using the computer only indirectly involves software," Postley said.

"It's there but the user never becomes associated with it. Just as when I drive my car I don't have to know how the ignition system works."

The greatest strength of the software industry, Postley said, is that people are coming to realize that it's not necessary to start from scratch to write their own programs every time.

This means that software companies can centralize programming so that people use programming written by others.

"The means are now at hand to apply more standardized techniques to software or to the applications they implement," he added.

"We are becoming more capable of building a system to handle a variety of requirements and this parallels the development of the hardware industry," he said.

"We have developed software generalized enough and powerful enough to do a variety of jobs for people, which means we can invest more and more in making it high quality."

Postley said users can expect lower and lower costs per application although total costs may rise because of growing requirements.

What's Software?

Innovations in software, Postley said, will, in the long run, make it possible for people to use computers without ever having heard of software.

Near term, he looks for the growing development of remote computing, with private and public companies having their own.

The biggest problem, he feels, is that of communication between the user and the programmer.

"It is very difficult for a user to explain what he needs. Sometimes the needs haven't been thought through or explicitly stated at all."

The result, he said, is that often the programmer, not understanding, writes a program with relatively little effort and two years later it is decided that is not what was wanted, but it is too late to change.

"The user has to be able to express what he really needs at a level required by the programmer," he said.

Postley does not consider IBM a dominant force in software nor likely to be one. "They don't seem to have that as one of their primary objects as in hardware."

The independent software house, he said, faces a shakeout with the smaller companies hardest hit because of their narrow focus.

"There are over 1,600 software companies, but only a few are large enough to have substantial financial resources."

Postley questioned whether the Informatics merger with Equitable Computer Corp. is part of that shakeout.

Rather, he feels Informatics will still be a separate entity, independent of any computer company and in a much stronger position for growth.

The merger was not, he said, forced by financial problems.

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Dearborn Completes 360 Portfolio Sale

HOUSTON – Dearborn-Storm has completed the sale of its IBM 360 portfolio to a group of private investors for $17 million in cash.

The new company, Dearborn Computer Leasing Co., will continue with the same management and staff which previously operated Dearborn-Storm's Computer Leasing Division.

There are no changes in leases, noted controller Ira Levy.

The portfolio sale has significantly improved Dearborn-Storm's financial position and earnings opportunities, according to Arthur Weiss, chairman of the board.

The sale price was nearly equivalent to the current value of cash flows that would have been generated from the Computer Leasing Division over the remaining life of the portfolio, without the risk factor inherent in computer leasing activities, he noted.

To Write Off 360s by End of '75

Itel Focusing on More Profitable 370s

By Molly Upton
Of the CW Staff

NEWTON, Mass. – Itel's decision to exit from the IBM 360 leasing business was not based on a lack of faith in the viability of that area of enterprise, but was a question of deployment of resources, Itel Data Products Group President Richard Lussier observed during a recent interview.

In fact, Itel did not see its 360 leasing business losing money in the firm's projections through 1979, he added.

But the 370 leasing operation and outright sales contributed significantly to the firm's 1973 earnings, he said.

"We planned to do about $1 million to $2 million in outright sales on 370 peripheral gear in 1973 and we did $8 million to $10 million," Lussier noted.

Under the Itel plan to divest itself of its 360 portfolio, users may acquire their 360s at the end of their leases. Itel has established a net locked-in receivable, or the amount it must receive as of the end of 1975 on each machine, based on the age of the machine when itel acquired it and other factors.

Each price is individual, Lussier stressed, depending on these factors. The firm is writing 18- to 24-month leases, as it has agreed with its accountants to write off its inventory by the end of 1975.

When asked why Itel chose to sell the units individually rather than to another dealer, Lussier replied, "We're better at marketing than we are at having fire sales." Prices on the 360s vary from 15% to 40% of the original value of the machine.

Itel has 360 and related equipment valued at $208 million in original cost. Of that, about $7 million to $8 million is in enhancements, he noted. This translates into about 200 CPUs, he said.

The leases Itel is offering are "very competitive with standard operating leases, and in the end the user gets ownership," he noted.

Under the procedure established for writing off its 360 portfolio, Itel has established a $30 million reserve, which it took the year ended Dec. 31, 1973. Any additional loss – or profit – on the disposition of the 360s will be shown at the end of 1975.

No Slackening

Itel sees a considerable market in 370/158s and 168s this year for its full payout leases. Most of these leases are for eight years. Lussier said he sees no slackening in 1974 in these long-term leases.

Based on projections compiled for Itel, the number of 158s and 168s shipped during 1974 should more than double the 1973 totals, he said.

In 1973, according to estimates, there were 250 158s shipped, and this will reach 550 in 1974, while shipments of 168s will jump from 70 in 1973 to 175 in 1974, he noted.

Shipments of 135s and 145s peaked during 1973, according to the figures, with 760 135s in 1973 and 550 in 1974. There were about 1,200 145s shipped last year, but only 350 are expected to be shipped this year.

Itel is in data processing products as well as leases, although it did sell its Information Storage Systems Division to Univac last year.

Itel's double-density disk drive will be out the first quarter of 1975, and its fixed head file product – similar to the IBM 2305 – will be available later this year, Lussier said.

In the memory line, Itel will bring out an AMS memory for the 158 this spring, and a memory for the 168 later in the year.

Lussier noted that DP would be a tough business if all a firm was doing was trying to be compatible with IBM. "I'm glad we're not in the manufacturing business," he added.

Itel buys one line from ISS, but other than that selects its products from a wide range of manufacturers.

Bank Clearinghouse Expands With B6700

NEW YORK – The New York Clearing House Association has installed a Burroughs B6700 in the third expansion of the organization's communications network to handle a growing volume of interbank money transfers.

The Clearing House Interbank Payments System currently handles interbank transfers of $40 billion to $50 billion a day. The B6700 will assume work being performed by two B3500s which store and release payment messages and process intrabank book transfers. The system includes 99 Burroughs TC 500 terminals.

Orders & Installations

Other Orders, Installations

New York University Computer Center has leased two 65K-word ARM-1108 memory units from Ampex Corp. for its Univac 1108.

– – –

The Research Corp. (TRC) of New England has installed a Xerox 530 for environmental research and business data processing.

– – –

Southern California Edison Co. has ordered a multicomputer energy management system from Control Data Corp., which includes two Cyber 70 Model 73s and 12 SC1700s.

DPF 6- to 60-Month Lease Gives 360s Lift

By Vic Farmer
Of the CW Staff

HARTSDALE, N.Y. — With the announcement of DPF's six-to-60-month lease last week the firm confirmed its philosophy of handholding with users to keep its 360 installed base viable.

The Flexi Lease, as it is termed by DPF, allows users to upgrade with independent peripherals, systems, and software enhancements almost continually so the user doesn't feel tied down to any specific IBM configuration.

As part of the handholding, DPF supplies system design analysis and evaluations using hardware and software monitors that will give the user as efficient a system as he can get, according to Michael J. Creedon, vice-president, marketing.

DPF is positive of the cost performance of the 360 line, and is willing to offer the short-term lease to prove the 360 has the capabilities the user needs. And if the user outgrows the 360 line, DPF will also install a 370 system.

In a sense the lease will allow the user to get a progressively growing system as he needs it without having to install a larger system than he presently needs because of anticipated future needs.

The turnaround for system changes may be as little as six months, Creedon said.

Some of the independent technical developments DPF is working on include an adaptation of an IBM 3330-type disk drive for a Model 30, and several software enhancements.

Creedon said these studies have shown most users can get higher throughput and performance by using bigger memory and higher-speed tapes and disks.

DPF is also working on a package to convert Model 20 RPG I programs to DOS Model 30 RPG II.

For the users operating their Model 30s in single partition DOS, "we can add Edos from The Computer Software Co. and additional memory to convert to multipartition operation."

On performance measuring, DPF will work with a user to determine his needs, either with its own monitors or through the use of Boole and Babbage help.

"Our object is not so much to sell the user a product but to come up with alternatives and suggestions the user can select to get an understanding of what improvements can do for him," he said.

"System evaluation and specific software enhancements of the Edos type are most important.

Operating System Changes Too

"The ability to put more core on and faster tapes, and disk is fine, if you can use it, but frequently you have to make a few operating system changes to the system and that leads to monitoring studies. It's a continuing process," Creedon related.

Aside from the leasing area, Creedon said the IBM 2311 disk drive has become a real "hot-cake."

"Two years ago the 2311s were almost impossible to place; today they are very hard to get because the price has been cut and they are very attractive for storage. Many 370 users have also attached them as systems packs. We're actually obtaining some of them for our own customer sites," he indicated.

But the machine that is a real plague today is the IBM 2701 line controller "because the independents are beating the hell out of it.

"If you're a big 2701 holder, you have to be very imaginative to find new applications," he said.

CDC to Sell MTI Add-Ons for 370s

SUDBURY, Mass. — Control Data Corp. has included Memory Technology, Inc. (MTI) add-on memories in its line of IBM 370 peripherals.

Under a nonexclusive arrangement, CDC has bought MTI's installed lease base of 370 add-on systems and will purchase and market additional units. CDC also handles memories made by Advanced Memory Systems.

CDC will include the MTI units as part of its product line, providing field maintenance, spare parts and field technical support for all MTI-installed units, an MTI spokesman said.

CDC is purchasing MDS semiconductor units for the 145, 155 and 165 and the contract calls for 135 and 158 and 168 systems in the future.

The contract is "a major step in our efforts toward making Memory Technology a significant OEM supplier of computer products . . . from complete memory systems and special memory modules to memory components," observed MTI President John J. Marino.

If you'd like to know more about Audit, Privacy and Security in Data Processing Systems, vote 'yes' below.

Auditing, privacy and security are important problems for most EDP installations today. And this proposed new seminar will cover all three — in a concentrated 2½-day session. If response is sufficient, we'll be conducting the seminar in one or more cities in June, 1974.

The course will cover several key areas

Topics to be covered in this comprehensive seminar include the following:

- Who is responsible for computer room security?
- Who is responsible for data security?
- How to protect data from unauthorized acquisition, modification and destruction.
- How to preclude unauthorized users.
- Types of identification methods for terminals and users.
- Authorization methods for programs and data — including software controls and lockout features.
- Real-time surveillance to detect violations.
- Cryptography.
- Recovery techniques for real-time systems.
- The changing role of the auditor.

Joe Wasserman will be the seminar leader

Mr. Wasserman is president of Computer Audit Systems, Inc., and a recognized leader in this field. He is one of the first people to specialize in this area, having started over 15 years ago with the Bell System. He has been widely quoted by leading newspapers, including The Wall Street Journal and New York Times, and has written several articles in the security field. He is a Certified Internal Auditor.

Mr Wasserman will lead the seminar and coordinate presentations of several other experts in various aspects of the security field.

Free Resource Notebook for all participants

A complete Resource Notebook will be used throughout the seminar and will become a valuable continuing reference work for all participants.

Who Should Attend?

If you have anything to do with the security, privacy or auditing of a data processing installation, this seminar can be of great value in your work in this complex, but increasingly important area. It will help your installation, your company and your own performance.

Vote now, enroll later

Your vote on the coupon below will give us an indication of the demand for this seminar in several cities. Your vote does not obligate you in any way, but it will put your name on our mailing list. When plans are completed, you will receive a complete brochure and seminar registration form. If you're interested, don't delay. The seminar offering depends on your response today. We anticipate that the total fee for the seminar will be $325, including the resource notebook.

To: Walter Boyd, Computerworld, 797 Washington Street, Newton, Mass. 02160

☐ Yes. I'm interested in your proposed seminar on Audit, Privacy and Security in Data Processing Systems. Please send me complete details when plans have been completed.

If the seminars are held in June, I believe I would attend in the following city:

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Name _____ Title _____

Company _____

Address _____

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THE EDP SEMINAR SERIES

SPONSORED BY COMPUTERWORLD

IBM Price Hikes Reach UK Users

LONDON — Users of IBM DP equipment in the UK have been hit with price increases, and others are on the way.

Many of the increases were announced in 1972 but were frozen because of the government's Phase One regulations, noted Fred Clarke, IBM UK's director of data processing.

On Feb. 21, increases of up to 10.5% were levied on purchased equipment. However, the increases do not apply to units shipped within six months of that date.

Rental increases generally occur in two stages: March 1 and Aug. 21. For example, rental on a typical 370/158 rose 0.5% on March 1 and will rise 7.5% Aug. 21. Rental on a System 3/15 will not increase until Aug. 21, when it will jump 7%.

Maintenance charges on purchased equipment are being increased up to 25% in two stages: as of March 1, generally 15%, and the remainder as of May 21.

Other charges are also being raised. Program products will go up as much as 7% as of May 21. Education courses will cost 20% more after April 1.

International News

ICL Gets First Order For New Range System

BATH, England — Bath University has ordered a P4, the first of International Computer Ltd.'s New Range computers, according to a report in *Computer Weekly*.

The unit will service Bath, Bristol and Exeter Universities and will be linked with the Cardiff Joint Computer Center, which serves three other institutions.

The P4 will be linked with a Control Data Corp. 1700 as part of the present System 4 network, which includes an ICL 4/75 at Bristol, a 4/70 at Cardiff and 4/50s at Bath and Exeter.

Two U.S. Firms to Share Canadian Network Contract

MONTREAL — Two American firms, Interdata, Inc. and Sanders Associates, Inc., will share in the $17.5 million contract let to CAE Electronics Ltd., a Canadian firm, for the trans-Canadian air traffic control network called Jets (Joint Enroute Terminal System).

Interdata of Canada, Ltd. has received a contract to provide more than 200 Model 70 minicomputers valued at more than $2.5 million over the next three years.

Initially the units will be made in the U.S., but the firm will begin manufacturing subsystems at Mississauga in the second quarter of this year.

Sanders will supply the first two display subsystems, which will then be manufactured by CAE in Canada. Sanders will continue to make the indicator modules.

The contract to CAE is the first part of a three-phase, $69.9 million project under which CAE will build a simulator, a preproduction development system, a training system, several area control systems and two terminal control systems.

Singer Business Machines Expects Good Year in UK

LONDON — Singer Business Machines is expecting a good year in the UK.

Mike Burton, marketing chief, is predicting a 40% increase in the company's revenues in 1974 compared with 1973, according to an article in *Computer Weekly*.

Retail terminals, he estimated, should comprise about 30% of the total orders placed this year.

Earnings Reports

HEWLETT-PACKARD
Three Months Ended Jan. 31

	1974	1973
Shr Erng	$.54	$.33
Revenue	169,168,000	126,966,000
Earnings	14,530,000	8,685,000

DATA PACKAGING
Year Ended Dec. 1

	1973	1972
Shr Erng	$.77	$.73
Revenue	18,240,341	13,746,720
Spec Crad	a312,853	------
Earnings	1,177,727	994,175

a-From sale of a division and a 50%-owned subsidiary.

SANGAMO ELECTRIC
Year Ended Dec. 31

	1973	1972
Shr Erng	$1.82	$1.43
Revenue	96,198,000	87,239,000
Earnings	4,907,000	3,861,000

WALLACE BUSINESS FORMS
Three Months Ended Jan. 31

	1974	1973
Shr Erng	$.51	$.36
Revenua	13,852,000	10,552,000
Earnings	927,000	657,000
6 Mo Shr	.92	.69
Revenue	25,145,000	19,835,000
Earnings	1,675,000	1,247,000

BOOTHE COMPUTER
Year Ended Dec. 31

	1973	1972
Revenua	$46,291,000	$50,299,000
Spec Cred	------	a1,146,000
Loss	21,206,000	36,534,000

a-From sale of stock of subsidiaries.

TRACOR
Year Ended Dec. 31

	a1973	1972
Shr Erng	$2.00	$1.72
Revenua	81,058,000	78,678,000
bSpec Cred	2,633,000	2,046,000
Earnings	4,859,000	4,122,000
3 Mo Shr	.43	.36
Revenua	20,926,000	19,468,000
bSpec Cred	532,000	794,000
Earnings	1,045,000	1,351,000

a-Includes operations of Astro-Sciarp, subsidiary through April 1973, after which it was sold. b-Consists of tax credits, equity in extraordinary items of affiliates and gains and losses of certain subsidiaries and investments.

CORDURA
Three Months Ended Jan. 31

	1974	a1973
Shr Erng	$.50	$.33
b Revenua	18,469,000	13,716,000
Dirc Op	167,000	6,000
Spec Crad	c1,300,000	------
Earnings	2,851,000	2,043,000

a-Restated to reflect change in accounting methods and to exclude results of discontinued operations. b-From continuing operations. c-Gain on reduction of provision for loss on dispositions.

BRADFORD COMPUTER & SYSTEMS
Year Ended Dec. 31

	a1973	1972
Shr Erng	$.91	$.55
Revenua	46,421,000	32,632,000
Spec Crad	36,000	37,000
Earnings	3,136,000	1,970,000
3 Mo Shr	.23	.16
Revenue	11,598,000	9,579,000
Spec Item	7,000	(12,000)
Earnings	886,000	554,000

INSTRUMENT SYSTEMS
Three Months Ended Dec. 31

	1973	1972
Shr Erng	$.04	$.05
Revenues	53,248,000	46,922,000
Earnings	386,000	491,000

FABRI-TEK
Three Months Ended Dec. 28

	1973	1972
Shr Erng	$.19	$.11
Revenua	9,210,245	5,949,996
Spec Item	(161,382)	a246,200
Earnings	612,639	390,022
9 Mo Shr	.51	.15
Revenua	25,501,709	15,660,135
aSpec Crad	354,000	a324,058
Earnings	1,668,696	506,029

a-In 1973, tax-loss carryforward credit; in 1972, includes gain on purchase of company's debentures plus tax credits.

WAVETEK
Four Months Ended Jan. 16

	1974	1973
Shr Erng	$.23	$.18
Revenue	2,843,600	2,272,700
Earnings	200,600	155,700

HAZELTINE
Year Ended Dec. 31

	1973	1972
Shr Erng	$.83	$2.58
Revenua	79,379,606	64,368,270
aSpec Cred	431,372	4,368,127
Earnings	1,623,883	5,050,281
3 Mo Shr	.10	.24
Revenua	24,537,606	23,198,270
Earnings	199,511	472,154

a-In 1973, tax-loss carryforward credit; in 1972, gain on sale of properties and tax credit.

Position Announcements

SENIOR FIELD ENGINEER

GRAHAM MAGNETICS, INC. is presently seeking a SENIOR FIELD ENGINEER, to provide technical support for a National Sales Staff. Individual will handle customer relations in a technical capacity and conduct in-plant studies of competitive products. A minimum of two year's experience as a field engineer for a major computer company is preferred. Specific experience in Magnetic Tape Systems is required. GRAHAM MAGNETICS, INC. is one of the world leaders in the Data Processing Industry. We offer a complete package of benefits which include profit sharing, vacations, hospitalization and life insurance. GMI is located in the North Texas Lake Country where family living is at its best.

Send Resume and Salary History to:
Personnel Dept.
GRAHAM MAGNETICS, INC.
Hwy. 380
Graham, Texas 76046

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We are seeking an experienced technical executive to direct our hardware software development program, from project conception, through design and development, to product acceptance. The candidate must be fully familiar with the complete spectrum of current computer technology, and the trends developing in the computer world. Creative leadership qualities are required to direct a staff of experienced electronic engineers.

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Consolidated Computer, Inc. is the largest Canadian-owned computer company. Its KEY-EDIT* key-to-disk data entry system has gained international acceptance resulting in the largest order backlog in the industry. KEY-EDIT systems are installed in 16 countries throughout the world. The company is now introducing a new series of terminal-oriented data entry systems to meet the latest demands of the marketplace.

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Address enquiries in confidence to Mr. Clif Hawkins, Consolidated Computer, Inc., 2421 Lancaster Road, Ottawa, Ontario K1B 4L5.

CONSOLIDATED COMPUTER INC

Computerworld Sales Offices

Vice President—Marketing: *Neal Wilder.* **Sales Administrator:** *Dottie Travis.* Computerworld, 797 Washington St., Newton, Mass. 02160. Tel: (617) 965-5800.

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WASHINGTON, DC 20330 PHONE: (202) 274-8461

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The Center houses a Univac 70/3 time-sharing computer and provides admin. and I/R services to the College and secondary schools within 75 mile radius. The College (3,000 enrollment) is located in the scenic northern tier area of Pennsylvania a few miles south of Elmira, New York. 11 other excellent fringe benefits.

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Electronic Systems Personnel
2105 Penobscot Building
Detroit, Michigan 48202

HARTFORD
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Washington, D. C. 20036

esp associates

Northern Regional Manager: *Robert Ziegel.* **Account Manager:** *Mike Burman.* Computerworld, 797 Washington St., Newton, Mass. 02160. Tel: (617) 965-5800.

Eastern Regional Manager: *Donald E. Fagan.* **Account Manager:** *Frank Gallo.* Computerworld, Suite 1511, 225 W. 34th St., New York, N.Y. 10001. Tel: (212) 594-5644.

Los Angeles Area: *Bob Byrne.* Robert Byrne & Assoc., 1541 Westwood Blvd., Los Angeles, Calif. 90024. Tel: (213) 477-4208.

San Francisco Area: *Bill Healey.* Thompson/Healey Assoc., 1111 Hearst Bldg., San Francisco, Calif. 94103. Tel: (415) 362-8547.

Japan: *Ken Suzuki.* General Manager, Dempa/Computerworld, 1-11-15 Higashi Gotanda, Shinagawa-ku, Tokyo 141.

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FACULTY POSITION OPEN
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Applications are invited for a faculty position as an Assistant Professor of Engineering in the Electrical Design Program beginning September, 1974. Applicants should have a background in electrical engineering or computer science with a specialty in computer systems and associated hardware. Their interests should lean more toward various applications of computer technology, such as the interfacing of computers with systems used in biomedical engineering, information retrieval, etc., than toward the development of computer systems themselves. A strong interest in research and/or design is desirable. Candidates must be qualified to each undergraduate and graduate courses, supervise graduate student projects, and develop and conduct research programs. Staring salary will depend on qualifications and experience. Interested persons should submit a complete resume and references as soon as possible, and no later than 1 May '74, to:

Professor John W. Strohbehn
Thayer School of Engineering
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Rosemont, Illinois 60018
(312) 297-4410

CLEVELAND
3121 Euclid Avenue
Cleveland, Ohio 44115
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Dallas, Texas 75247
(214) 630-8081

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Mrs. Campbell

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Written application should be mailed by April 1, 1974 to:

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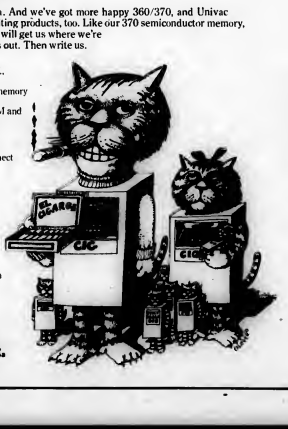

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For First Quarter
HP Earnings Rise 67%

PALO ALTO, Calif. – Hewlett-Packard reported a 67% increase in earnings and a 49% increase in revenues for the first quarter ended Jan. 31.

Earnings totaled $14.5 million or 54 cents a share compared with $8.7 million or 33 cents a share in the similar year-ago period.

Revenues reached $189.2 million compared with $127 million in the corresponding quarter last year.

President William R. Hewlett said: "Despite the energy crisis and its potential negative effect on some of our markets . . . incoming orders for the quarter were up 39% to $217.3 million compared with orders of $156.1 million last year."

International orders amounted to $108 million, up 59% from last year's first quarter, while domestic orders were up 24% to $109.2 million, he said.

Hewlett also noted that the company has cancelled its previously stated plans to seek long-term financing of approximately $100 million.

"We had planned to use this financing to pay off a portion of our short-term debt, which currently amounts to about $110 million," he said. "However, with our improved profit margin, long-term financing is not necessary at this time."

Itel Net Climbs Despite Charge For Discontinued 360 Operation

SAN FRANCISCO – Itel Corp. reported sharply higher earnings for 1973 despite a $30 million charge from the discontinuance of the 360 leasing business.

For the year ended Dec. 31, the company earned $5.6 million or 70 cents a share compared with $1.7 million or 24 cents a share a year ago.

Revenues from continuing operations reached $108.5 million compared with $40.5 million.

Income from continuing operations rose to $8.2 million or $1.09 a share, compared with $600,000 or 8 cents a share in 1972.

The charge for the discontinued 360 business was partially offset by a $19 million gain on the sale of Information Storage Systems, Inc. and an extraordinary gain of $2.1 million from a tax-loss carryforward.

President Peter S. Redfield said continuing operations contributed significantly to the profit rise.

The 1972 results included a $100,000 loss from discontinued operations and a $1.2 million tax credit. Last year's results were restated to reflect the discontinued operations.

"The increase in pre-tax income from continuing operations dramatizes clearly the extent to which Itel's mainstream business – capital equipment leasing, transportation services and data services – has developed," he noted.

Redfield said the "1973 results are still largely predicated on certain future events." He said the accountants' report "will be subject to the final outcome of the discontinuance of the 360 business and the final determination of the gain on the sale of Information Storage Systems."

Six-Month Results Set Compuscan Record

TETERBORO, N.J. – Compuscan, Inc., manufacturer of optical character recognition systems, had record results for the second quarter and six months ended Nov. 30.

For the six months, earnings rose 41% to $386,000 or 27 cents a share from $273,000 or 18 cents a share a year ago.

Revenues for the period rose 40% to $3.4 million from $2.5 million.

In the quarter, the company earned $215,000 or 15 cents a share compared with $166,000 or 11 cents a share in the same year-ago period.

Revenues totaled $1.8 million, up 28% from $1.4 million last year.

Both years included tax-loss carryforward credits.

...Toward the Bottom Line

A flurry of firsts!

Data Card initiated a quarterly cash dividend policy with its first dividend of 2 cents a share payable March 6 to stockholders of record Feb. 25.

And **Automatic Data Processing** declared its first dividend of 10 cents payable March 1 to holders of record Feb. 8. The firm intends to make semiannual dividends.

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The Depository Trust will expand its list of securities eligible for computerized bookkeeping delivery by adding approximately 2,000 callable registered corporate bonds and preferred stocks in 1974.

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Boothe Computer has terminated negotiations for acquisition of the company by National Computer Rental because the structuring of the transaction could not be effected under California Corporation Code. Booth has reactivated talks with others, however.

$$$

Investors in **Electronic Data Systems** are feeling the economic pinch, since the demise of duPont Walston & Co., a firm from which EDS reportedly derived 20% of its revenues and profits by furnishing DP services.

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Xerox reported worldwide revenues from computers were up 14% but said that sector continued to operate unprofitably. "We look for improved computer operations," said Chairman C. Peter McColough, "but near-term profits aren't expected because of long-term investments in research, development and marketing." Overall, year-end earnings climbed to a record $300.5 million or $3.80 a share from 1972's $249.5 million or $3.16 a share.

Earnings Reports

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Three Months Ended Dec. 31

	1973	1972
Shr Erng	.....	$.07
Revenue	$3,458,480	2,625,809
Tax Cred	.....	33,000
Earnings	(397,971)	74,996
6 Mo Rev	6,798,028	4,916,595
Loss	363,325	51,389

TERMINAL DATA
Year Ended Sept. 30

	e1973	1972
Shr Erng	$.18	$.74
Revenue	4,056,309	3,415,810
Earnings	136,407	524,239

a-Includes consolidation of Precision Diabraze Tor, Inc. in the nine months.

BUNKER RAMO
Year Ended Dec. 31

	1973	1972
Shr Erng	$.82	e$1.57
Revenue	290,624,000	251,965,000
Earnings	7,709,000	13,461,000
3 Mo Shr	.....	$.59
Revenue	74,637,000	64,167,000
Earnings	(181,000)	4,779,000

e-Adjusted for a one-for-three reverse stock split in April 1973.

SYSTEM DEVELOPMENT
Three Months Ended Dec. 23

	1973	e1972
Shr Erng	$.25	$.20
Revenue	21,129,000	17,610,000
Earnings	482,000	403,000
6 Mo Shr	.46	.38
Revenue	40,449,000	33,034,000
Earnings	886,000	717,000

e-Restated to reflect one-for-two reverse stock split in October 1972, and pooling of interest in September 1972.

ADVANCED MEMORY SYSTEMS
Three Months Ended Dec. 28

	1973	e1972
Shr Erng	$.02	$.29
Revenue	7,374,000	6,659,000
bSpec Cred	15,000	371,000
Earnings	31,000	549,000

e-Restated. b-In 1973, tax credit; in 1972, tax credit plus renegotiations of capitalized lease obligations.

BOLT BERANEK & NEWMAN
Three Months Ended Dec. 31

	1973	e1972
Shr Erng	$.24	$.22
Revenue	5,087,400	3,797,700
Disc Op	.....	58,600
Spec Cred	.....	b19,500
Earnings	259,900	271,800
6 Mo Shr	.45	.40
Revenue	10,236,900	7,458,700
Disc Op	.....	105,500
Spec Cred	.....	b19,500
Earnings	563,100	502,400

e-Restated to reflect discontinued operations. b-Gain on sale of minority interest in consulting company.

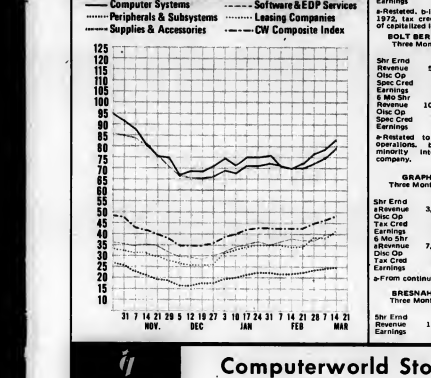
GRAPHIC SCIENCES
Three Months Ended Dec. 31

	1973	1972
Shr Erng	$.07	$.08
aRevenue	3,706,000	2,331,000
Disc Op	2,000	73,000
Tax Cred	65,000	71,000
Earnings	215,000	253,000
6 Mo Shr	.15	.21
aRevenue	7,022,000	4,844,000
Disc Op	25,000	164,000
Tax Cred	168,000	224,000
Earnings	462,000	693,000

a-From continuing operations.

BRESNAHAN COMPUTER
Three Months Ended Dec. 31

	1973	1972
Shr Erng	$.04	$.07
Revenue	1,222,000	1,428,000
Earnings	81,000	128,000



Computerworld Stock Trading Summary

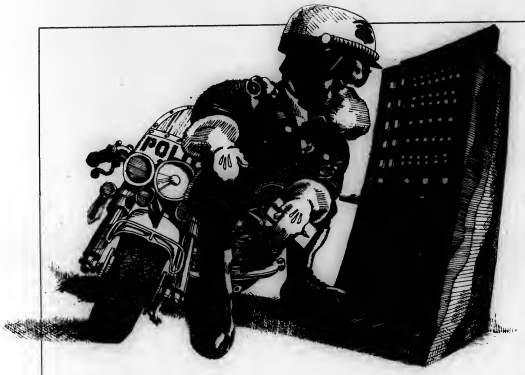
All statistics compiled, computed and formatted by TRADE•QUOTES, INC. Cambridge, Mass. 02139

E X C H N	1973-74 STOCK RANGE (1)	CLOSE MAR 14 1974	WEEK NET CHANGE	WEEK PCT CHANGE
	COMPUTER SYSTEMS			
N	SHIPPINGPORT CORP	175-262	214 1/4	+7 1/4	+3.5
N	COLLINS RADIO	14- 26	24 3/4	0	0.0
O	COMPUTER AUTOMATION	4- 20	13	+1	+8.3
N	CONTROL DATA CORP	31- 62	34 7/8	+1	+2.7
N	DATA GENERAL CORP	29- 55	35 1/2	+1 3/8	-3.7
N	DATAPOINT CORP	16- 71	15 1/4	+1 1/4	+8.9
O	DIGITAL COMP CONTROL	2- 5	3	0	0.0
N	DIGITAL EQUIPMENT	73-121	119 1/4	+4 7/8	+4.2
N	ELECTRONIC ASSOC.	2- 4	3	+1/8	+3.4
A	ELECTRONIC ENGINEER.	4- 14	9 1/8	+1 1/4	+12.5
N	GRI	21- 38	25 1/4	+1 1/4	+5.2
O	HEWLETT-PACKARD CO	77- 97	95 1/4	+3 1/2	+3.8
O	HONEYWELL INC	68-139	96	+5 1/2	+7.3
N	IBM	277-345	288 3/4	+9	+3.2
I	INTERDATA INC	7- 21	20 1/2	+9	+44.6
A	MICRODATA CORP	2- 10	7 1/2	+ 1/2	+7.1
N	NCR	27- 44	38 7/8	+3/8	+0.9
N	PERKIN ON CO	22- 39	38 1/8	+1 1/8	+3.0
N	SINGER CO	35- 74	37 3/4	+2 1/2	+7.0
N	SPERRY RAND	34- 54	43 3/4	+1 5/8	+3.9
A	SYSTEMS ENG. LABS	1- 7	3 1/2	+1/2	+16.6
N	TEXAS INSTRUMENTS	83-134	98	+1 5/8	+1.5
I	ULTIMATE SYSTEMS INC	1- 11	1 1/8	- 1/8	-10.0
N	VARIAN ASSOCIATES	10- 20	12 1/2	+ 3/8	+3.8
N	WANG LABS.	13- 34	17 1/8	+ 1/2	+3.0
N	XEROX CORP	108-169	124	+10 1/4	+9.0
	LEASING COMPANIES			
A	BOOTHE COMPUTER	1- 4	1 1/8	0	0.0
O	BRESNAHAN COMP.	1- 2	2	0	0.0
O	COMPUTER LEASING	1- 7	5 3/8	- 1/8	-2.2
O	COMMERCE GROUP CORP	3- 6	5 3/4	+ 3/8	+7.5
O	COMPONENT EXCHANGE	1- 1	1	0	0.0
A	COMPUTER INVSTRS GRP	1- 9	2 3/4	- 1/2	-15.3
O	COMP. INSTALLATIONS	1- 3	1 1/4	- 1/4	+20.0
N	DATRONIC RENTAL	1- 3	1 3/4	- 1/4	-12.5
O	DEL AMO INC	1- 1	1	0	0.0
O	DEARBORN-STORM	12- 26	17	+2	+13.3
O	DPF INC	1- 2	1 1/2	0	0.0
O	EMP RESOURCES	1- 3	3 1/4	0	0.0
A	EQUITEC NAT	1- 3	1 3/4	0	0.0
A	GREENWOOD COMPUTER	3- 10	5 1/2	+ 3/8	+7.3
A	LTV	1- 4	1 3/8	+ 1/8	+9.9
N	LEASCO CORP	9- 18	11 1/2	+ 1/2	+4.5
O	LEASPAC CORP	1- 5	3/8	+ 1/8	+18.8
O	LEIGHTON NAT INC	2- 3	3/8	0	0.0
O	MFG INC	3- 15	4 1/4	- 1/4	-5.5
A	PIONEER TEX CORP	4- 6	4 1/8	- 3/8	-10.0
A	ROCKWOOD COMPUTER	1- 3	1	0	0.0
N	U.S. LEASING	16- 36	22 3/4	+ 1/2	+4.5

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
I=NATIONAL; M=MIDWEST; O=OVER-THE-COUNTER
A-THE PRICES ARE BID PRICES AS OF 3 P.M. ON LAST BID
(1) TO NEAREST DOLLAR

E X C H N	1973-74 STOCK RANGE (1)	CLOSE MAR 14 1974	WEEK NET CHANGE	WEEK PCT CHANGE
	SOFTWARE & EDP SERVICES			
O	ADVANCED COMP TECH	1- 2	1 1/8	0	0.0
O	AMERICAN DATA PROC.	3- 6	4	2 1/4	+ 1/8	+5.9
O	APPLIED LOGIC	1- 1	3/4	0	0.0
N	AUTOMATIC DATA PROC	35- 51	51 1/4	+1 1/8	+2.2
O	BRANDON APPLIED SYST	1- 1	5/8	0	0.0
O	CENTRAL DATA SYSTMS	1- 1	5/8	0	0.0
O	COMPUTER DIMENSIONS	1- 5	2 7/8	+ 1/4	+9.5
O	COMPUTER HORIZONS	1- 4	2 1/2	- 1/8	-4.7
O	COMPUTER NETWORK	1- 3	1 1/2	- 1/4	-15.7
O	COMPUTER SCIENCES	1- 5	3 1/2	+ 1/8	+3.7
O	COMPUTER TASK GROUP	1- 3	1/2	- 1/8	-20.0
O	COMPUTER TECHNOLOGY	1- 1	1/2	0	0.0
O	COMPUTING USAGE	1- 3	3/4	0	0.0
O	COMPRESS	1- 2	1	0	0.0
O	CHRONOS	1- 2	1	0	0.0
O	CHRONOS CORP	1- 15	3 1/4	- 1/4	-7.1
O	DATATAB INC	1- 3	1 1/4	0	0.0
A	ELECT COMP PROG	1- 2	1/4	0	0.0
O	ELECTRONIC DATA SYS.	11- 25	12 3/4	- 1/2	-3.8
O	INFONATIONAL INC	1- 2	3/8	0	0.0
O	INFORMATICS	2- 7	4 3/4	0	0.0
O	INFO. DATA CORP	1- 2	1 1/4	0	0.0
O	INS COMPUTER MARKET.	1- 5	1 1/4	0	0.0
O	KEANE ASSOCIATES	2- 5	3 1/8	+ 1/4	+8.3
O	KEYDATA CORP	1- 12	4 5/8	0	0.0
O	LOGICON	3- 6	4	- 5/8	-13.5
O	MANAGEMENT DATA	1- 4	2	+ 1/2	+33.3
O	NATIONAL CSS INC	10- 47	36 1/2	+2	+5.7
O	NATIONAL COMPUTER CO	1- 2	1/2	- 1/8	-20.0
O	NATIONAL INFO SRVCS	1- 2	1	0	0.0
O	ON LINE SYSTEMS INC	12- 29	28 1/2	0	0.0
O	PLANNING RESEARCH	1- 3	3	+ 1/8	+4.3
O	PROGRAMMING METHODS	17- 25	17	0	0.0
O	PROGRAMMING & SYS.	1- 2	1	0	0.0
O	RAPIDATA INC	2- 24	3 1/8	+ 1/2	+19.0
O	SCIENTIFIC COMPUTERS	2- 4	3/4	+ 1/8	+20.0
O	SIMPLICITY COMPUTER	1- 4	1	0	0.0
O	SOFTWARE CENTERS	1- 3	1 1/2	0	0.0
O	TCC INC	1- 1	1/4	0	0.0
O	SYNSHARE INC	1- 10	2 1/8	+ 1/4	+13.3
O	UNITED DATA CENTER	3- 6	3 1/2	0	0.0
A	UNI SYSTEMS	1- 4	1 1/2	0	0.0
O	WILT CORP	3- 11	4 1/2	+ 1/2	+12.5
	PERIPHERALS & SUBSYSTEMS			
N	ADDRESSOGRAPH-MULT	9- 36	10 1/2	- 1/8	-1.1
O	ADVANCED MEMORY SYS	4- 21	5 1/4	- 1/4	+4.5
O	AMPEX CORP	3- 7	3	- 1/4	-7.7
O	ANDERSON JACOBSON	2- 4	3	+ 1/2	+20.0
O	BERKEYE MEDICAL ELEC	4- 10	5 1/2	+ 1/4	+4.7
A	BOLT,BERANEK & NEW	6- 12	9 1/2	+ 1/4	+2.7
O	BUNKER-RAMO	6- 14	7 3/4	- 1/8	-1.6
A	CALCOMP	6- 16	10 7/8	+1 1/2	+16.0
A	CAMBRIDGE MEMORIES	2- 17	13 1/4	+ 7/8	+7.0
O	CENTRONICS DATA COMP	15- 38	21	+2 1/4	+12.0
O	CHDEX CORP	4- 12	13	0	0.0
O	COGNITRONICS	1- 1	7/8	0	0.0

E X C H N	1973-74 STOCK RANGE (1)	CLOSE MAR 14 1974	WEEK NET CHANGE	WEEK PCT CHANGE
O	COMPUTER COMMUN.	1- 4	1	- 1/8	-11.1
A	COMPUTER EQUIPMENT	1- 4	1 3/4	- 1/8	+6.6
O	COMPUTER MACHINERY	1- 3	1 1/4	+ 1/2	0.0
O	COMPUTER TRANSDUCER	1- 4	1 1/8	- 1/8	+12.5
N	COMRAC CORP	15- 32	26	+1	+4.0
N	DATA ACCESS SYSTEMS	1- 3	1 3/4	0	0.0
N	DATA 100	9- 15	12 1/4	+ 1/2	+3.9
A	DATA PRODUCTS CORP	2- 9	4 1/4	+ 1/8	+0.8
A	DATA RECOGNITION	1- 3	1	1/2	0.0
A	DATA TECHNOLOGY	1- 4	3 3/4	0	0.0
N	DECISION DATA COMPUT	4- 40	10 1/2	+ 1/2	+10.5
O	DELTA DATA SYSTEMS	1- 1	7/8	0	0.0
O	DIGITAL CONTROLS	1- 4	1 3/4	0	0.0
N	ELECTRONIC M & N	3- 4	3 7/8	- 1/8	-3.3
O	FANNITEK	1- 2	1 1/4	0	0.0
A	GENERAL COMPUTER SYS	3- 4	3 3/4	1/8	+3.3
N	GENERAL ELECTRIC	74- 94	83 1/2	-2 1/4	-2.6
N	HAZELTINE CORP	4- 9	5 1/4	- 1/4	+5.0
O	HYDRIL CO	4- 6	5 1/2	+ 1/2	+9.9
O	INFORMATION DISPLAYS	1- 2	1 1/2	- 1/8	-20.0
A	INFORMATION INT. INC	1- 2	1	1/4	+2.2
A	LIMIT ELECTRONICS	1- 4	2 1/2	0	0.0
A	MANAGEMENT ASSIST	1- 2	1	0	0.0
N	MEMOREX	7- 15	13 1/8	+ 1/8	-3.8
N	MILGO ELECTRONICS	14- 29	17	0	+4.2
N	MOHAWK DATA SCI	7- 15	14 1/8	+ 7/8	+26.0
A	MPSC COMPUTER SYST.	2- 4	3	0	0.0
O	OPTICAL SCANNING	2- 4	3	0	0.0
O	PERIPHERONICS	1- 4	3 3/4	0	0.0
O	PHOTON	3- 7	3 3/4	0	0.0
O	PRINTER INSTRUMENT	2- 5	3 1/4	0	0.0
O	PRECISION INST.	2- 4	2	0	0.0
O	QUANTUM CORP	4- 19	7 1/2	+1 1/4	+14.3
O	REFORMATION EQUIP	2- 4	3 1/8	- 5/8	-16.0
O	SANDERS ASSOCIATES	14- 19	14 1/2	0	0.0
O	SCAN DATA	1- 4	1 3/4	0	0.0
O	STORAGE TECHNOLOGY	11- 34	30 3/4	- 1/4	-1.9
O	SYCOR INC	9- 29	11 1/2	0	0.0
O	TALLY CORP.	2- 14	11	0	0.0
N	TPC INC	5- 8	5	0	0.0
N	TYKTRONIX INC	35- 54	47 1/4	+5 1/8	+12.0
O	VADIC	2- 4	3 1/2	0	0.0
O	WANCO INC	7- 13	12	- 1/4	+2.1
O	WILTEK INC	7- 14	12	- 1/2	+7.8
	SUPPLIES & ACCESSORIES			
O	BALTIMORE RUB FORMS	4- 9	5 1/4	+1	+23.5
O	BARRY WRIGHT	3- 7	6 1/4	+ 1/4	+20.0
O	CYBERNETICS INC	1- 3	1 1/4	0	0.0
O	DATA CARD CORP	11- 23	13	+ 1/4	+1.9
O	DIABLE PRODUCTS INC	4- 18	9 3/4	+ 3/4	+8.0
O	FANIS RUB. FORMS	4- 9	5 1/2	+ 1/2	+9.8
O	GRAHAM MAGNETICS	7- 20	10 1/2	+2	+23.5
O	GRAPHIC CONTROLS	7- 12	9 3/4	+ 3/4	+8.3
O	3M COMPANY	60- 91	79	+2 3/8	+3.0
O	MOORE CORP LTD	40- 65	51 3/4	- 3/4	+1.4
N	NASHUA CORP	34- 58	48 7/8	+ 7/8	+2.1
O	REYNOLDS & REYNOLD	24- 41	33 3/4	+1 3/4	+29.0
O	STANDARD REGISTER	11- 20	14 1/2	- 1/4	+1.7
O	TAB PRODUCTS CO	7- 23	7	0	0.0
N	TAPCO	15- 23	20 3/8	- 3/4	-3.5
O	VARIAN MAGNETICS	5- 8	6 3/4	- 1/2	+8.0
N	WALLACE RUS FORMS	14- 24	17 1/4	- 3/8	-2.1



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